USER MANUAL

## UNINTERRUPTIBLE POWER SUPPLIES (UPS)

# SLC X-PERT

# 80.. 400 kVA

salicru

## General index

# 1. INTRODUCTION.

## 1.1. THANK YOU LETTER.

We thank you in advance for the confidence you placed in us by purchasing this product. Read this instruction manual carefully in order to familiarise yourself with its content, since the more you know and understand the device the greater your satisfaction, level of safety and optimisation of its functionalities will be.
We remain at your disposal for any additional information or queries that you may wish to make.

Yours sincerely.

**SALICRU**

- The device described here **is capable of causing significant physical injury if improperly handled**. For this reason, its installation, maintenance and/or repair must be carried out exclusively by our staff or by **qualified personnel**.
- Although no effort has been spared to ensure that the information in this user manual is complete and accurate, we accept no liability for any errors or omissions that may exist.
- The images included in this document are for illustrative purposes and may not exactly represent the parts of the device shown; therefore they are not contractual. However, any divergence that may arise will be remedied or solved with the correct labelling on the unit.
- Following our policy of constant evolution, **we reserve the right to modify the characteristics, operations or actions described in this document without prior notice**.
- Any **reproduction, copying, assignment to third parties, amendment or total or partial translation** of this manual or document, in any form or by any means, **without the prior written permission of Salicru is prohibited**, with the company fully and exclusively reserving its ownership rights over it.

# 2. SAFETY INFORMATION.

## 2.1. USING THIS MANUAL.

Documentation relating to any standard device is available to customers for download from our website **(www.salicru.com)**.

- For devices 'powered by socket,' this is the website for obtaining the user manual and **'Safety Instructions'** EK266*08.
- For devices with 'permanent connection' via terminals, a CD-ROM or pen drive containing all necessary information for connection and startup, including **'Safety Instructions'** EK266*08, may be supplied with it.

Before carrying out any action on the device relating to its installation or startup, change of location, configuration or handling of any kind, carefully read the safety instructions.
The purpose of the user manual is to provide information regarding safety and explanations of the procedures for installation and operation of the equipment. Read it carefully and follow the steps indicated in the order established.

**Compliance with the 'Safety Instructions' is mandatory and the user is legally responsible** for compliance and enforcement.

The device is delivered properly labelled for correct identification of each of its parts, which, together with the instructions described in this user manual, allows installation and start-up operations to be performed in a simple and organised manner without any doubts whatsoever.
Finally, once the equipment is installed and operating, it is recommended to save the documentation downloaded from the website, CD-ROM or pen drive in a safe and easy-to-access place, for any future queries or doubts that may arise.

The following terms are used interchangeably in the document to refer to:

- '**SLC X-PERT,' 'device,' 'unit' or 'UPS**'. - Uninterruptible power supply. Depending on the context of the phrase, it can refer either to the actual UPS itself or to the UPS and the batteries, regardless of whether or not it is all assembled in the same metal enclosure.
- '**Batteries or accumulators'** - Bank or set of elements that stores the flow of electrons by electrochemical means.
- '**T.S.S.**' - Technical Service and Support.
- '**Customer,' 'installer,' 'operator' or 'user'** - These are used interchangeably and by extension to refer to the installer and/or operator who will carry out the corresponding actions, and the same person may be responsible for carrying out the respective actions when acting on behalf, or in representation, of the above.

### 2.1.1. Conventions and symbols used.

Some symbols may be used and appear on the device, batteries and/or in the context of the user manual. For more information, see section 1.1.1 of document EK266*08 on **'Safety instructions'**.

# 3. QUALITY ASSURANCE AND STANDARDS.

## 3.1. STATEMENT BY THE MANAGEMENT.

Our goal is customer satisfaction, therefore this Management has decided to establish a Quality and Environment Policy, through the implementation of a Quality and Environmental Management System that will enable us to comply with the requirements demanded by standards **ISO 9001** and **ISO 14001** and also by our customers and stakeholders.
Likewise, the management of the company is committed to the development and improvement of the Quality and Environmental Management System, through:

- Communication to the entire company of the importance of satisfying both the customer's requirements as well as legal and regulatory requirements.
- The dissemination of the Quality and Environment Policy and the setting of the Quality and Environment objectives.
- Conducting reviews by the Management.
- Providing the necessary resources.

## 3.2. STANDARDS.

SLC X-PERT is designed, manufactured and sold in accordance with Quality Management Standard **EN ISO 9001**. The CE marking indicates conformity with EC Directives through the application of the following standards:
**2014/35/EU**. - Low voltage safety.
**2014/30/EU**. - Electromagnetic Compatibility (EMC).
**2011/65/EU**. - Restriction of the use of hazardous substances in electrical and electronic equipment (RoHS).
In accordance with the specifications of the harmonised standards. Reference standards:
**EN-IEC 62040-1**. Uninterruptible power supplies (UPS). Part 1-1: General and safety requirements for UPS used in user access areas.
**EN-IEC 62040-2**. Uninterruptible power supplies (UPS). Part 2: EMC requirements.

The manufacturer is not liable in the event of modification or intervention on the device by the user.

**WARNING!**
The SLC X-PERT is a category C3 UPS. It is a product for commercial and industrial application in the second environment; installation restrictions or additional measures may be necessary to avoid disturbances.

Also worth mentioning are systems for the maintenance of vital signs, medical applications, commercial transport, nuclear installations, or other applications or loads, where a failure of the product can lead to personal injury or material damage.

The product's CE declaration of conformity is available to the customer upon express request to our head office.

### 3.2.1. First and second environment.

The environment examples that follow cover most UPS installations.

### 3.2.2. First environment.

Environment including residential, commercial and light industry installations, directly connected, without intermediate transformers, to a low voltage public power grid.

### 3.2.3. Second environment.

An environment that includes all commercial, light industrial and industrial establishments that are not directly connected to a low voltage power grid supplying buildings used for residential purposes.

## 3.3. UKCA PRODUCT MARK AND UK AUTHORIZED REPRESENTATIVE.

UK CA product marking indicates that this UPS has been evaluated by Salicru and is deemed to comply with safety, health and environmental protection requirements.

The UK CA Declaration of Conformity is available upon request. For copies of of the UKCA Declaration of Conformity, please contact Salicru or check our website: www.salicru.com

UK Authorised Representative
Indele Limited
7 Bell Yard,
WC2A 2JR,
London

## 3.4. ENVIRONMENT.

This product has been designed respecting the Environment and manufactured in our certified facilities according to the **ISO 14001**.

**Recycling of the device at the end of its useful life:**
Our company undertakes to use the services of authorised and regulatory companies to treat the set of products recovered at the end of their useful life (contact your distributor).

**Packaging:**
For the recycling of the packaging there must be compliance with the legal requirements in force, in accordance with the specific regulations of the country where the device is installed.

**Batteries:**
Batteries pose a serious danger to health and the environment. The disposal of them shall be carried out in accordance with the laws in force.

# 4. PRESENTATION.

## 4.1. VIEWS.

### 4.1.1. Views of the device.

The following figures show different views of the devices in relation to the power rating of the model. Because the product is constantly evolving, however, discrepancies or slight contradictions may arise. If in any doubt, the labelling on the device itself will always prevail.

See the nameplate of the device to verify all of the values relating to its main properties and characteristics. Act accordingly for its installation.

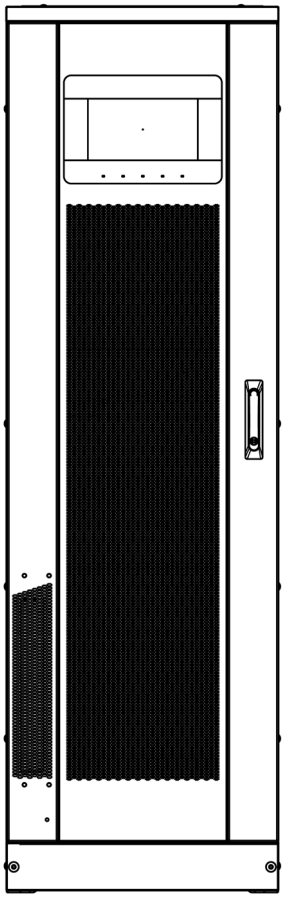


*Fig. 1. Front view of 80... 160 kVA models.*

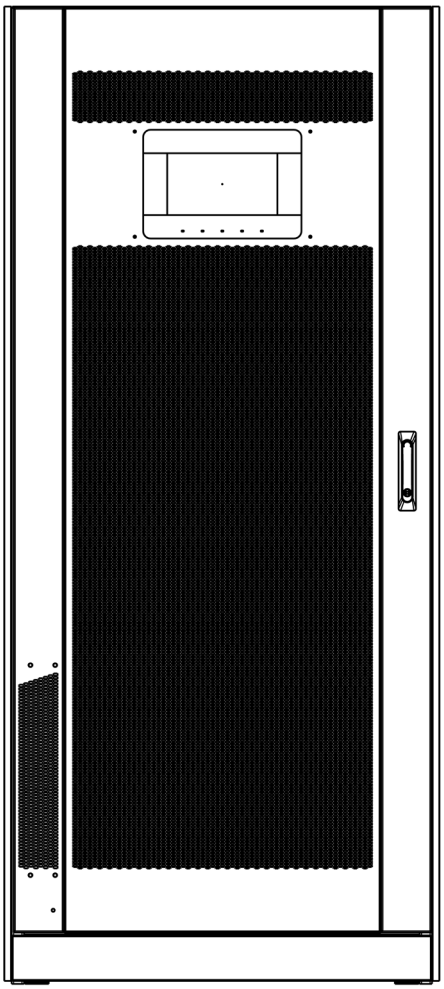


*Fig. 2. Front view of 200... 300 kVA models.*

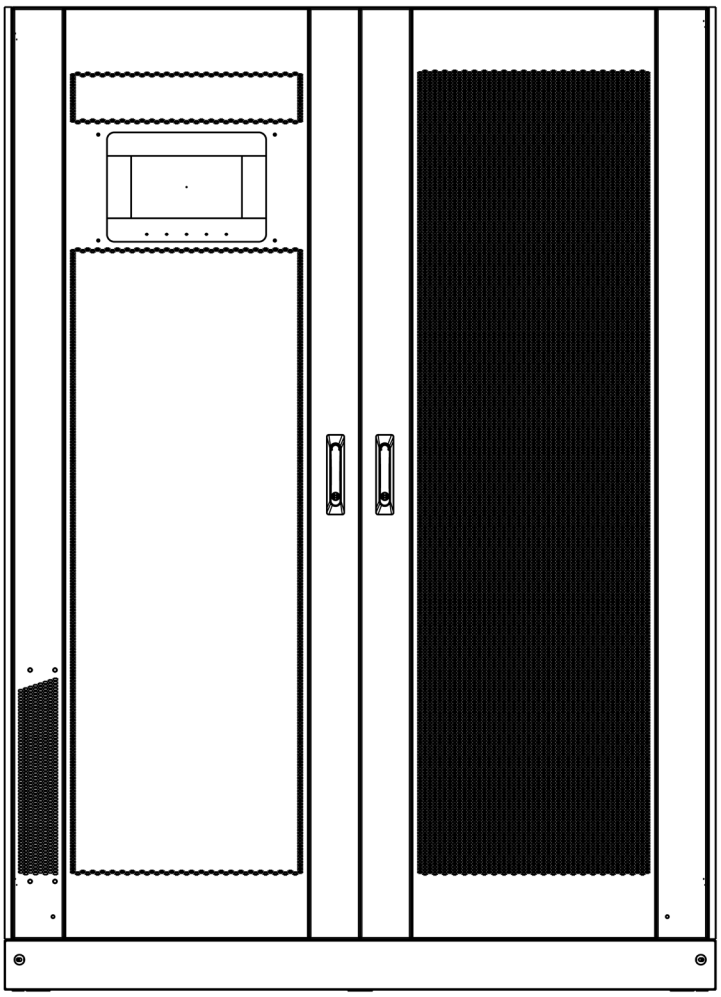
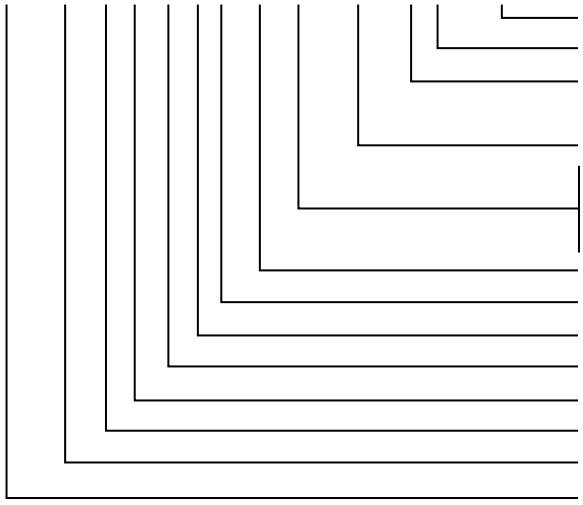


*Fig. 3. Front view of the 400 kVA model.*

## 4.2. DEFINITION OF THE PRODUCT.

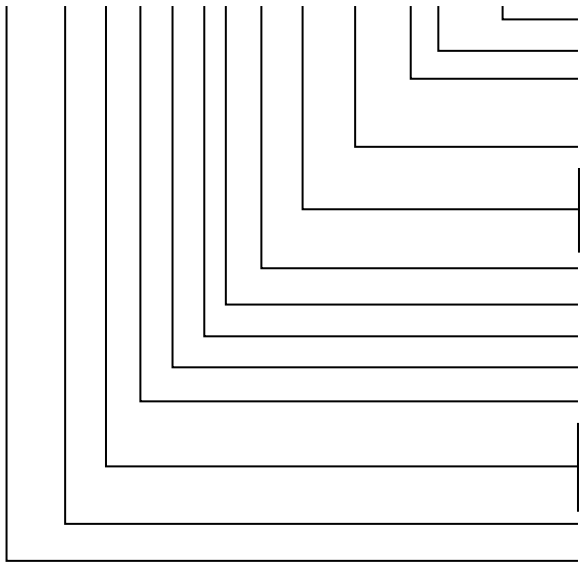
### 4.2.1. Nomenclature.

SLC-250-XPERT-P-CB 485 IR S SYNC B* 3x380V W CO EE116502



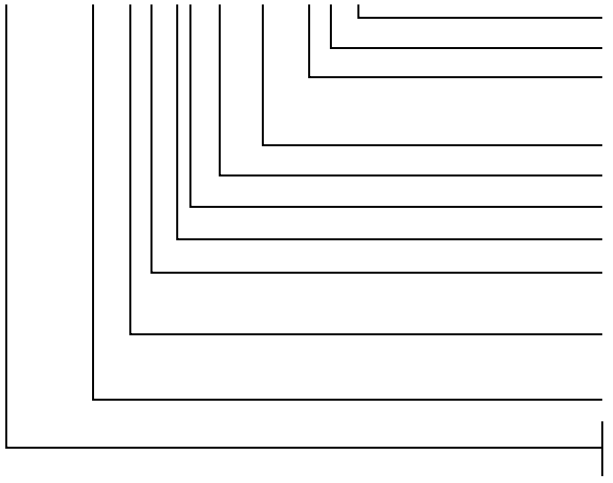
| | |
|---|---|
| EE | Special device (EE). |
| CO | 'Made in Spain' marking on UPS and packaging (for customs purposes). |
| W | Private-label device. The Salicru brand does not appear on covers, manuals, packaging, etc. |
| 3x380 V | Input and output voltage. Disregard if it is 3x400+N. |
| B1 | Device with external batteries. DC bus adjusted to 60 batteries. |
| B2 | Device with external batteries. DC bus adjusted to 62 batteries. |
| 3x60AB265 | Device with internal batteries (only 80 kVA). |
| SYNC | External inverter synchronism. |
| S | External battery temperature sensor. |
| IR | Potential-free contacts card. |
| 485 | RS-485 communications port with Modbus protocol. |
| CB | Common bypass line. |
| P | Parallel kit. |
| XPERT | UPS series. |
| 250 | Power in kVA. |

SLC-250-XPERT-P2-CB 485 IR S SYNC B* 3x380V W CO EE116502



| | |
|---|---|
| EE | Special device (EE). |
| CO | 'Made in Spain' marking on UPS and packaging (for customs purposes). |
| W | Private-label device. The Salicru brand does not appear on covers, manuals, packaging, etc. |
| 3x380 V | Input and output voltage. Disregard if it is 3x400+N. |
| B1 | Device with external batteries. DC bus adjusted to 60 batteries. |
| B2 | Device with external batteries. DC bus adjusted to 62 batteries. |
| 3x60AB265 | Device with internal batteries (only 80 kVA). |
| SYNC | External inverter synchronism. |
| S | External battery temperature sensor. |
| IR | Potential-free contacts card. |
| 485 | RS-485 communications port. |
| CB | Common bypass line. |
| P2 | Parallel system consisting of two devices. |
| ... | |
| P6 | Parallel system consisting of six devices. |
| XPERT | UPS series. |
| 250 | Power in kVA. |

MOD BAT XPERT 0/2x62AB999 100A WCO EE116502



| | |
|---|---|
| EE | Special battery module (EE). |
| CO | 'Made in Spain' marking on UPS and packaging (for customs purposes). |
| W | Private-label device. The Salicru brand does not appear on covers, manuals, packaging, etc. |
| 100 A | Protection size. |
| 999 | Last three digits of the battery code. |
| AB | Letters of the battery family. |
| 2 | Number of batteries in a single branch. |
| *x | Number of parallel battery branches in the same cabinet or in all racks. Disregard for a single branch. |
| 0/ | Battery module without batteries, but with the necessary accessories to install them. |
| XPERT | Battery module series. |
| MOD | Batteries in cabinet. |
| RACK | Batteries in rack. |

## 4.3. UPS NAMEPLATE.

The SLC X-PERT UPS model features a nameplate containing its operating values. The nameplate is affixed to the inside of the door of the UPS.

| SALICRU | X-PERT |
|---|---|
| **UPS** | **200kVA - 3Φ+N** |
| **RED 1 - RETE 1 - MAINS 1** | |
| Uin (Vac) | 400 -20/+15% |
| Iin (A) | 302 |
| Frecuencia-Frequenza-Frequency | 50÷60Hz ±10% |
| **RED 2 - RETE 2 - MAINS 2** | |
| Uin (Vac) | 380/400/415 ±10% |
| Iin (A) | 289 |
| Imax (A) | 434 |
| Iccmax (kA) | 10 |
| Frecuencia-Frequenza-Frequency | 50÷60Hz ±10% |
| **SALIDA - USCITA - OUTPUT** | |
| Uout (Vac) | 380/400/415 |
| Iout (A) | 289 * |
| Frecuencia-Frequenza-Frequency | 50÷60Hz |
| Potencia - Potenza - Power rating | 200kVA 200kW |
| | (* @ 400V) |
| Codigo-Articolo-Code | BSP06 |
| N° Serie - N° Serie - Serial number | H1IU40007 |
| Numero unidad-Unità-Unit numb.: | 1/1 |
| 720 | kg |
| Made in EU | |

*Fig. 4. Example of a nameplate for the SLC 200 X-PERT.*

**Verification of technical specifications.**
Before carrying out any installation or startup operations on the UPS, verify that its technical specifications are compatible with the AC power line and output loads.

## 4.4. DESCRIPTION OF THE UPS.

The UPS described in this manual is on-line, double-conversion; the inverter included in the UPS always supplies power to the load, either with or without the availability of mains power (according to the backup time of the batteries).
This configuration guarantees the best service to the user, supplying clean energy in an uninterrupted way, and ensuring voltage and frequency stabilisation at a rated value. Thanks to its double conversion, the critical loads will be completely immune to micro interruptions and mains variations, preventing damage to critical loads (computers, instruments, scientific devices, etc.).

**Presence of voltage at the output.**
The line connected to the UPS output is energised even during mains failures, so, in accordance with IEC EN62040-1-2, the installer must identify the line or sockets powered by the UPS, alerting users of the existence of a UPS in the facility.

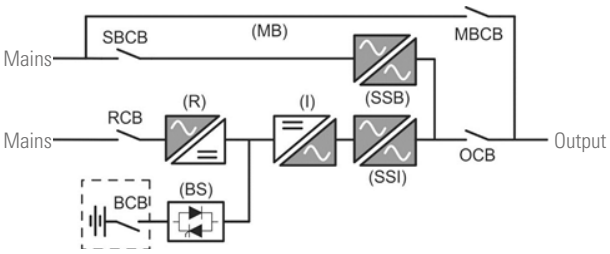



*Fig. 5. Block diagram of the SLC X-PERT UPS.*

The UPS uses high frequency switching IGBT technology that allows very low distortion of the current feed back into the supply line, as well as high-quality and stable output voltage. The components used ensure high reliability, excellent efficiency and ease of maintenance.

## 4.5. OPERATING PRINCIPLE.

### 4.5.1. Rectifier.

The rectifier converts three-phase AC mains voltage into direct DC voltage. It uses a fully controlled three-phase IGBT jumper with low harmonic absorption. The control electronics uses a state-of-the-art 32-bit microprocessor (μP) that enables reduction of the harmonic distortion of the current absorbed in the mains (THDi) to less than 3%. This ensures that the rectifier does not distort the supply network with respect to the other loads. It also prevents cable overheating caused by circulation of harmonic currents.
The rectifier is designed to power the inverter under full load and also charge the batteries with the maximum recharge current.

### 4.5.2. Inverter.

The inverter converts the DC voltage from the rectifier or batteries into alternating AC voltage, stabilised in amplitude and frequency.
The inverter uses IGBT technology in the power converter, with 3 levels for powers between 200... 400 kVA, and a switching frequency of 7.5 kHz.
The control electronics uses a state-of-the-art 32-bit microprocessor that, thanks to its processing capacity, generates a perfect sine-wave output waveform.
In addition, the fully digital control of the sine-wave output waveform provides high functionalities, including very low voltage distortion (linear load <1%, non-linear load <5% as per EN62040-3), even in the presence of highly distorting loads.

### 4.5.3. Batteries and battery charger.

The batteries must be installed outside the UPS, usually in an external cabinet or bank.
The logic of the battery charger is fully integrated in the rectifier control electronics.
The batteries are charged according to standard **DIN41773**, every time they have been partially or completely discharged. When their total capacity is restored, they disconnect from the DC bus by means of a static switch to save energy and reduce stress due to AC ripple, enabling their service life to

be increased. This operating mode is called *High-Efficiency*. Although they charge periodically, the state that predominates is complete standby.

#### 4.5.4. Static bypass.

The static bypass makes it possible to switch the load or loads between the inverter and the emergency mains and vice versa, without cutting. As power switching elements, it uses thyristors (SCR).

#### 4.5.5. Manual bypass.

The manual bypass is used to isolate the UPS completely, powering the load directly from the input mains in case of maintenance or serious failures.

Manual bypass transfer operations and return to normal functioning must be carried out according to the steps established in the relevant chapter of this document. The user will be solely responsible for any faults caused to the UPS, loads and/or installation as a result of incorrect actions.

**External manual bypass**.
In addition to the standard internal manual bypass, it is possible to optionally install an external manual bypass.

### 4.6. OPERATING STATES.

The UPS has five operating modes:
- Normal operation
- High-Efficiency operation
- Static bypass operation
- Battery operation
- Manual bypass operation

#### 4.6.1. Normal operation.

In normal operation, all switches/circuit breakers are in the ON position, except the MBCB (maintenance bypass).
The rectifier is powered by three-phase AC input voltage and this in turn powers the inverter and compensates for the variation in the mains voltage and load, thus keeping the DC voltage constant. At the same time, it is responsible for charging the batteries. The inverter converts the DC voltage into a sine waveform with stabilised voltage and frequency, and also powers the load through its static SSI switch.

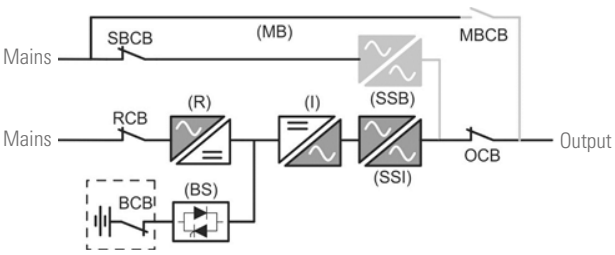



*Fig. 6. Normal operation.*

#### 4.6.2. High-Efficiency.

In this operating mode, the batteries are disconnected from the DC bus by means of a static switch, and the rectifier operates with reduced DC voltage; a control algorithm allows the batteries to be reconnected periodically for recharging purposes (intermittent charging).

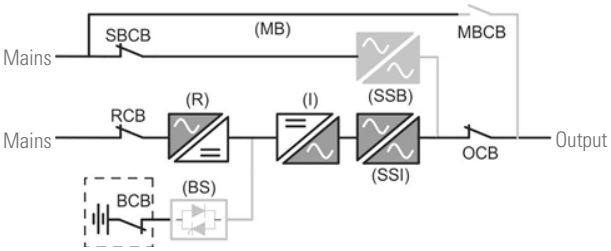



*Fig. 7. High-Efficiency.*

When the High-Efficiency algorithm is active, the rectifier operates with reduced DC voltage and only powers the inverter, since the batteries are disconnected from the DC bus. Battery charging is controlled by a specific algorithm. In the event that no mains outage events have occurred and therefore no battery discharges, the control logic provides a charging cycle every 25 days. The battery charger restores capacity lost from any self-discharge and remains in float charge mode for an additional 12 hours. As this time passes, the battery switch opens and the batteries disconnect from the DC bus.
In the event of a discharge event, the control logic calculates the capacity that was lost during the discharge; as the mains are restored, a load cycle is initiated and this is extended for an additional time that depends on the percentage of lost capacity with respect to the rated value.

- Loss of capacity <10% → Additional load for 12 hours.
- Loss of capacity between 10% and 20% → Additional load for 48 hours.
- Loss of capacity >20% → Additional load for 96 hours.

These values comply with the recommendations of the major battery manufacturers.

**Adjust battery capacity correctly.**
The front panel of the UPS enables adjustment of the parameters of the batteries, including the rated capacity. Taking into account the importance of such a value for the correct execution of the control algorithm, it is highly advisable to verify the accuracy of the programmed value.

#### 4.6.3. Bypass operation.

The load can be transferred to bypass both automatically and manually. Manual transfer is carried out using the 'Normal/Bypass' selector, which forces the load to be powered by the bypass. In the event of fault or failure of the bypass line, the load is transferred back to the inverter, all without interruption and without altering the power to the loads.

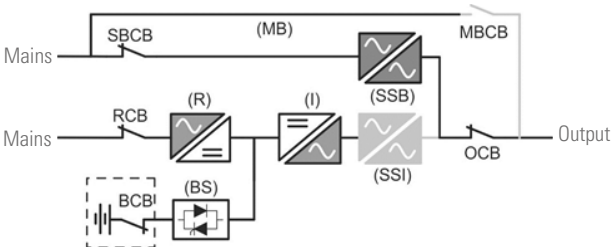



*Fig. 8. Load powered through the bypass line.*

### 4.6.4. Battery operation.

In the event of power failure or rectifier fault, the batteries will power the inverter without interruption. The voltage of the batteries decreases depending on the value of the discharge current. The drop in voltage does not affect the output voltage, which remains constant thanks to pulse width modulation (PWM).
In the event that supply is restored before the batteries are completely discharged, the system will return to normal operation automatically. If it is not, the inverter shuts down and the load is transferred to the bypass line (bypass operation). If the bypass line is not available or is outside the tolerance limits, the powering of the load is interrupted as soon as the batteries reach the discharge threshold limit (black-out).
As soon as the power is restored, the rectifier will recharge the batteries. In the standard configuration, the loads are powered again through the SSB static switch when mains power becomes available again. The inverter restarts when the batteries have partially recovered their capacity.
System restart from a condition of discharged batteries (*black-out*) can be customised according to the needs of the device in three ways:

- ❒ Bypass. The loads are powered as soon as the bypass line is available (factory setting).
- ❒ Inverter. The loads are powered through the inverter (even if the bypass line is available) when the battery voltage has reached the programmed threshold/level after the restart of the rectifier. This involves additional waiting time (which will depend on how discharged the batteries are) to power the loads from the moment the bypass is enabled.
- ❒ Manual inverter. The output power is not restored automatically. The system requires a confirmation to restart, which can be done manually by the user through the front panel.

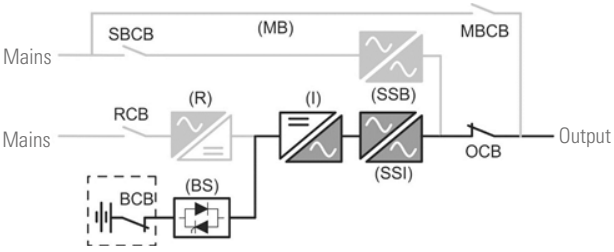



*Fig. 9. Battery operation.*

### 4.6.5. Manual bypass.

Intervention of the manual bypass is necessary whenever it is required to verify the functionality of the UPS, or during maintenance or repair work.

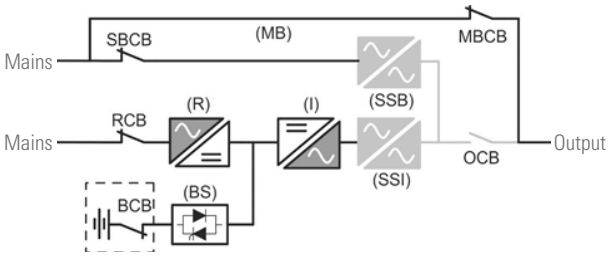



*Fig. 10. Manual bypass for function checks.*

**Follow the procedures described in the manual.**
The switching and return sequence of the manual bypass must be carried out in accordance with the procedure indicated in the relevant chapter of this document. The user will be solely responsible for any faults caused to the UPS, loads and/or installation as a result of incorrect actions.

**Wiring of the auxiliary contacts.**
Carry out an appropriate electrical installation by connecting the auxiliary contacts of the manual bypass and the output circuit breaker to the relevant terminals of the UPS. This will allow the control logic to acquire the state of the switches and guide the operator during start and manual bypass procedures.
While the device is in manual bypass mode for repairs or maintenance, the UPS is completely switched off and the load is powered directly through the bypass line.

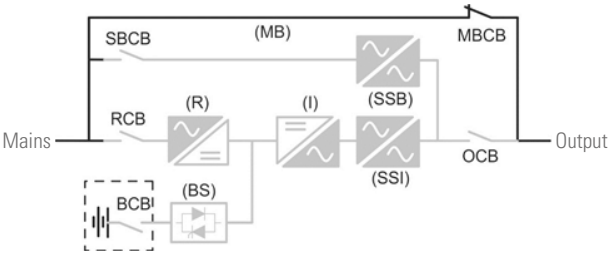



*Fig. 11. Manual bypass for repairs or maintenance.*

## 4.7. OPERATION AND CONTROL DEVICES.

The UPS's operation and control devices are indicated below:

- Rectifier circuit breaker (RCB)
- Static bypass circuit breaker (SBCB)
- UPS output circuit breaker (OCB)
- Manual bypass circuit breaker (MBCB)
- Battery circuit breaker/switch (BCB). External, in the battery cabinet
- Emergency power off button (EPO)
- Normal/Bypass selector
- Control panel with LCD display (powers between 80... 160 kVA) or touch screen (powers between 200... 300 kVA)

**Check that the maintenance personnel have been trained.**

The UPS's operation and control devices must only be used by authorised personnel. It is recommended to check that the personnel responsible for the use and maintenance of the system have been trained.

#### 4.7.1. Circuit breakers.

The UPS's circuit breakers are used to isolate the device from the AC power mains, the storage batteries and the load.

**Presence of voltage in device terminals.**

The circuit breakers do not isolate the UPS completely, since the AC voltage is still present in the input terminals of the UPS. Before performing any maintenance on the unit, it is necessary to:

- Isolate the UPS completely by activating the external switches.
- Wait at least 5 minutes to allow the capacitors to discharge.

#### 4.7.2. Emergency power off button (EPO).

The emergency power off button is used to disconnect the UPS output immediately, interrupting the powering of the loads. It also turns off the inverter.

**Only press the button in case of emergency.**

The components of the system are subjected to high stress when the button is pressed in the presence of load.
Only press the button in case of real emergency.

**Restoring the power supply.**

Restore the output power supply only when the causes of the emergency shutdown have been eliminated and it is certain that there is no danger to people or devices.

#### 4.7.3. Normal/Bypass selector.

The Normal/Bypass selector can be found on the top front of the device when the door is opened. It is usually used during the manual bypass procedure, when it is necessary to isolate the UPS for maintenance or repair work.

**Follow the procedures in the manual.**

The Normal/Bypass selector should only be operated by following the steps established in the relevant chapter of this document. The user will be solely responsible for any faults caused to the UPS, loads and/or installation as a result of incorrect actions.

#### 4.7.4. Control panel with LCD.

The UPS's control panel is used to:

- ❒ Check the device's operating parameters.
- ❒ Check the alarms present.
- ❒ Access the event history.
- ❒ Display the information on the device.
- ❒ Modify the operating parameters.

The menu enables modification of the setting parameters and is protected by a password to prevent access by unauthorised personnel.

## 4.8. OPTIONS.

Depending on the configuration chosen, the device can include any of the following options:

#### 4.8.1. Isolation transformer.

The isolation transformer provides galvanic isolation in order to completely isolate the output from the input and/or change the neutral point treatment. The placement of an electrostatic screen between the primary and secondary windings of the transformer provides a high level of electrical noise attenuation. The isolation transformer can be physically placed at the input or output of the UPS depending on the technical conditions of the whole system (device supply voltage and/or load voltage, their characteristics or type, etc.). This component can be installed within the 80 kVA device, connecting the batteries externally. It will always be supplied as a peripheral component external to the device itself in a separate enclosure.

#### 4.8.2. External manual maintenance bypass.

The purpose of this option is to electrically isolate the device from the mains and the critical loads without cutting the power to the latter. In this way, maintenance or repair operations on the device can be carried out without interruptions to the power supply of the protected system, while preventing unnecessary hazards for technical personnel.

#### 4.8.3. Communication card.

The UPS features a slot at the rear for inserting one of the following communication cards:

##### 4.8.3.1. Integration into computer networks using an SNMP adapter.

Large computer systems based on LANs and WANs that integrate servers in different operating systems must provide the system manager with ease of control and administration. This facility is obtained through an SNMP adapter, which is universally supported by the main software and hardware manufacturers. Connection of the UPS to the SNMP is internal while that of the SNMP to the computer network is made through an RJ-45 10 base connector.

##### 4.8.3.2. RS-485 MODBUS.

Large computer systems based on LANs and WANs often require that communication with any element that is integrated into the computer network be made through a standard industrial protocol, MODBUS being one of the most used. The SLC X-PERT series can also be integrated into these types of environment using an RS RS485 MODBUS card.

4.8.3.3. Relay interface.

- The UPS has, as an option, an interface card with five relays that provides digital signals in the form of potential-free contacts, with a maximum applicable voltage and current of 250 V AC or 30 V DC and 1 A.
- This communication port enables dialogue between the device and other machines or devices through the relays of the terminal block on the same card, featuring a single common terminal for all of them. From the factory, all contacts are normally open and can be changed one by one, as indicated in the documentation supplied with the optional extra.
- The most common use for these types of ports is to provide the necessary information to the file-closing software.
- For more information, contact our **T.S.S.** or nearest distributor.

### 4.8.4. Common battery.

See Section 6.6. PARALLEL SYSTEM IN COMMON BATTERY CONFIGURATION.

# 5. INSTALLATION.

- Read and observe the Safety Information described in Chapter 2 of this document. Failure to observe the instructions described in this manual could result in serious injury to personnel in direct contact or close by or faults in the device and/or loads connected to it.
- In addition to the device's own user manual, other documents are supplied on the CD-ROM or documentation pen drive. Consult them and strictly follow the indicated procedure.
- Unless otherwise indicated, all actions, instructions, guidelines and notes are applicable to all possible devices and configurations.

## 5.1. RECEPTION OF THE DEVICE.

- It is dangerous to handle the device on the pallet, as it could overturn and cause serious impact injuries to operators and/or entrapment. Pay attention to section 1.2.1 of the EK266*08 safety instructions in all matters relating to the handling, movement and siting of the unit, as well as the relevant sections of this document.
- Use the most suitable means to move the UPS while it is packed, such as a pallet jack or forklift.
- Any handling of the device must be carried out in accordance with the weights shown in the technical specifications according to the model, indicated in Chapter 9. Annexes.

### 5.1.1. Reception, unpacking and contents.

- Reception. Check that:
  - ❒ The information on the label affixed to the packaging relates to that specified on the order. Once the UPS is unpacked, check the above-mentioned information against that on the nameplate. If there are discrepancies, report the issue as soon as possible, citing the device's manufacturing number and delivery note references.
  - ❒ It has not suffered any mishaps during transportation (packaging and impact indicator in perfect condition). Otherwise, follow the protocol indicated on the label attached to the impact indicator, located on the packaging.
- Unpacking.
  - ❒ To check the contents, it will be necessary to remove the packaging.

Complete the unpacking according to the procedure in section 5.1.3.

- SLC X-PERT device contents:
  - ❒ UPS with the corresponding power.
  - ❒ Wiring necessary for installation.
  - ❒ Warranty.

  Once the reception is completed, it is advisable to re-pack the UPS until it is put into service in order to protect it against mechanical shock, dust, dirt, etc.
- The packaging of the device consists of a wooden pallet, cardboard or wooden box, depending on the item, expanded polystyrene corners, polyethylene cover and strapping, all of which are recyclable materials. When the packaging requires disposal, it must be carried out in accordance with current laws. We recommend keeping the packaging for at least 1 year.

### 5.1.2. Storage.

- The device should be stored in a dry, ventilated location protected from rain, dust, water splashes and chemical agents. It is advisable to keep each device and battery unit in its original packaging, as it has been specifically designed to ensure maximum protection during transportation and storage.
- For devices that contain Pb-Ca batteries, the charging times indicated in Tab. 2 of document EK266*08 regarding the temperature to which they are exposed, must be respected, otherwise the warranty may be invalidated.
- After this period, connect the device to the mains together with the battery unit if applicable, start it according to the instructions described in this manual and charge for at least 12 hours.
- In parallel systems, it is not necessary to interconnect devices before battery charging. Each of them can be treated independently to charge them.
- Then shut down the device, disconnect it and store the UPS and batteries in their original packaging, noting the new date for recharging the batteries on a document as a record or even on the packaging itself.
- Do not store the devices where the ambient temperature exceeds 50 °C or drops below -15 °C, as this may cause degradation of the electrical characteristics of the batteries.

**Special environmental conditions**

It is necessary to implement specific protective measures in case of unusual environmental conditions:

- Noxious smoke, dust, abrasive dust.
- Humidity, vapour, salty air, bad weather or leakage.
- Explosive dust and gas mixtures.
- Extreme variations of temperature.
- Poor ventilation.
- Conductive or radiant heat from other sources.
- Fungi, insects, parasites.

### 5.1.3. Unpacking.

- The packaging of the device consists of a cardboard box, expanded polystyrene (EPS) or polyethylene foam (EPE) corners, polyethylene cover and strapping, all of which are recyclable materials; consequently, if it requires disposal, it must be carried out in accordance with current laws. We recommend keeping the packaging in case it needs to be reused.
- Proceed as follows:
  - ❒ Cut the straps around the cardboard box.
  - ❒ Remove the accessories (cables, brackets, etc.).
  - ❒ Remove the device or battery module from the box with

the help, if necessary, of a second person depending on the weight of the model or using appropriate mechanical means.

❒ Remove the protective corners from the device and the plastic bag.

Do not leave the plastic bag within the reach of children to avoid the danger of suffocation.

❒ Inspect the device before proceeding and, in the event of finding damage, contact the supplier or, failing that, our firm.

### 5.1.4. Transport to the site.

- It is recommended to transport the UPS by means of a pallet jack or the most appropriate method considering the distance between the two points.
- If the distance is considerable, it is recommended to transport the device in its packaging to the installation site and then unpack it.

**The device is heavy.**

❒ Make sure that the UPS does not topple over during transportation.

❒ The cabinets should always be kept in the upright position.

❒ During loading and unloading operations, always follow the instructions marked on the packaging.

- Before positioning the device, and to prevent it from toppling over, it is advisable to move the entire system together with the wooden pallet on which it is mounted. For removal from the pallet, remove the lower rear and front parts and insert the forks of the forklift. The UPS can be moved from its front according to the spaces available.

### 5.1.5. Siting.

#### 5.1.5.1. Siting for single devices.

- For correct ventilation of the device, ensure that the space around it is free from obstructions. Observe the minimum distances indicated in Table 2 and Table 3 of section 5.1.7 of this document, in which the values for distances A, B, C and D are indicated according to the power of each device. For the battery cabinets, maintain the distances recommended for the UPS itself.
- For extended backups with more than one cabinet, it is recommended to place one on each side of the device and, in the case of a greater number of battery cabinets, repeat the same sequence alternately.

#### 5.1.5.2. Siting for parallel systems.

- It is recommended to place them in order according to the number (No.) indicated on the door of each device. The number corresponds to the address originally assigned at the factory.
  The arrangement is optimum considering the length of the wiring of the batteries and the communications bus. For a greater number of battery cabinets in systems with extended backup, follow the same criterion, maintaining the symmetry.
- If the system consists of models with the batteries and device mounted in the same cabinet, the battery module illustrations should be disregarded.
- For correct ventilation of the device, it is necessary to leave its surroundings free from obstructions. Observe the minimum distances indicated in Table 2 and Table 3 of section 5.1.7 of this document, in which the values for distances A, B, C and D are indicated according to the power of each device.
- For the battery cabinets, maintain the distances recommended for the UPS that makes up the system itself.

### 5.1.6. Plan view of the base, static load and weights.

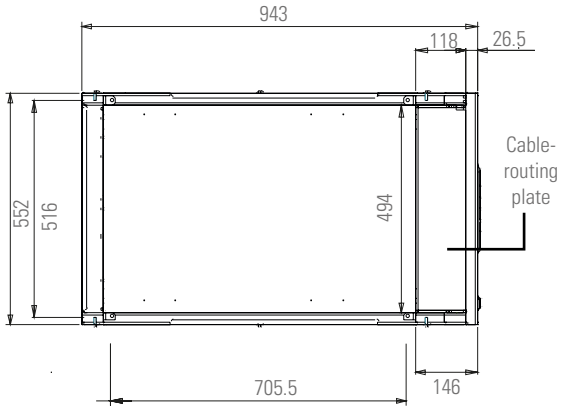



*Fig. 12. Plan view of the base of 80... 160 kVA devices.*

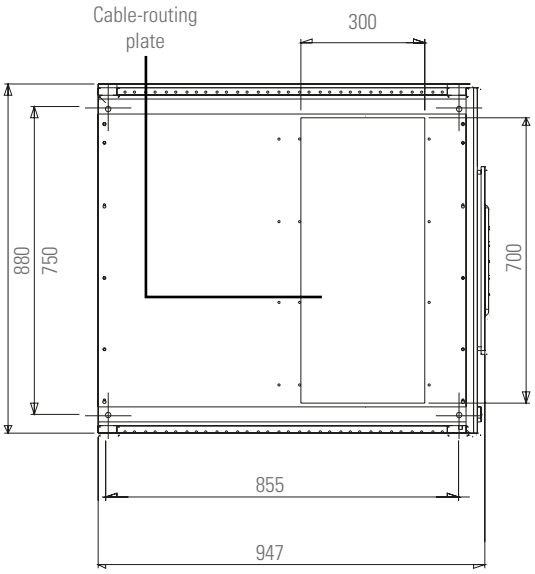



*Fig. 13. Plan view of the base of 200... 300 kVA devices.*

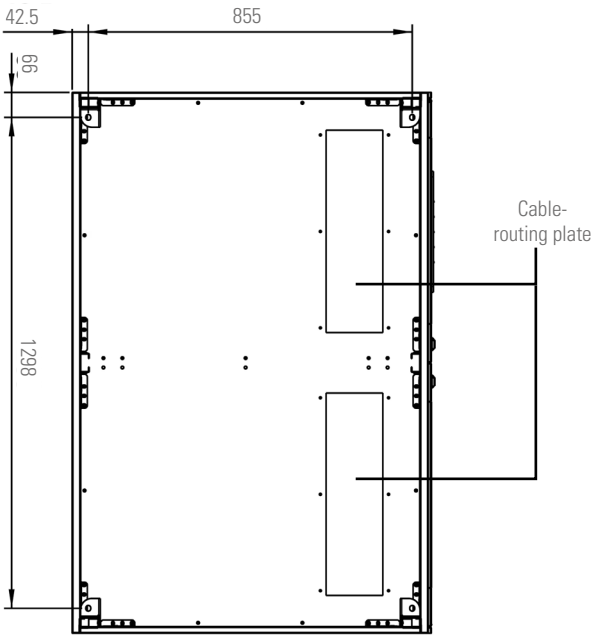



*Fig. 14. Plan view of the base of 400 kVA devices.*

The UPS's support base must be designed to support its weight and guarantee its stability. Its load capacity must be appropriate for the static loads indicated in the following table:

| Power (kVA) | 80 | 100 | 125 | 160 | 200 | 250 | 300 | 400 |
|---|---|---|---|---|---|---|---|---|
| Weight (kg) | 300 | 320 | 360 | 380 | 720 | 850 | 900 | 1080 |
| Static load (kg/m²) | 590 | 630 | 710 | 750 | 1120 | 1280 | 1395 | 1390 |

*Table 1. Weight and static load for each device.*

### 5.1.7. Dimensions, space and ventilation.

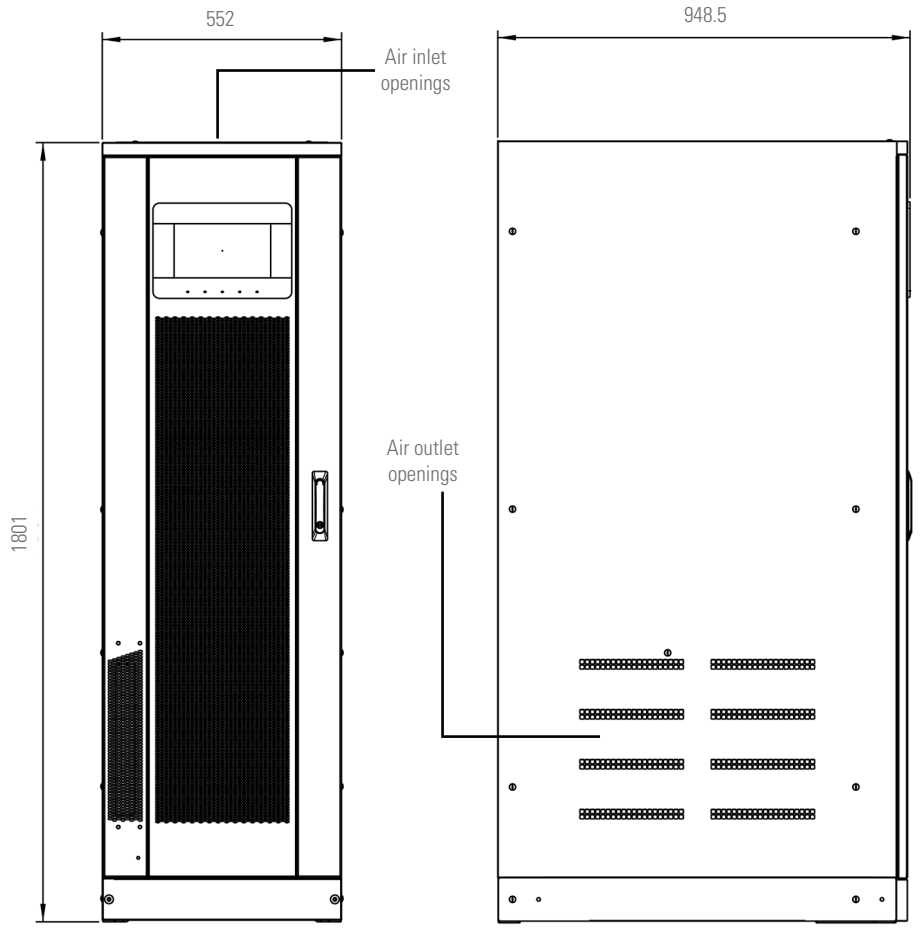



*Fig. 15. Dimensions of 80... 160 kVA devices.*

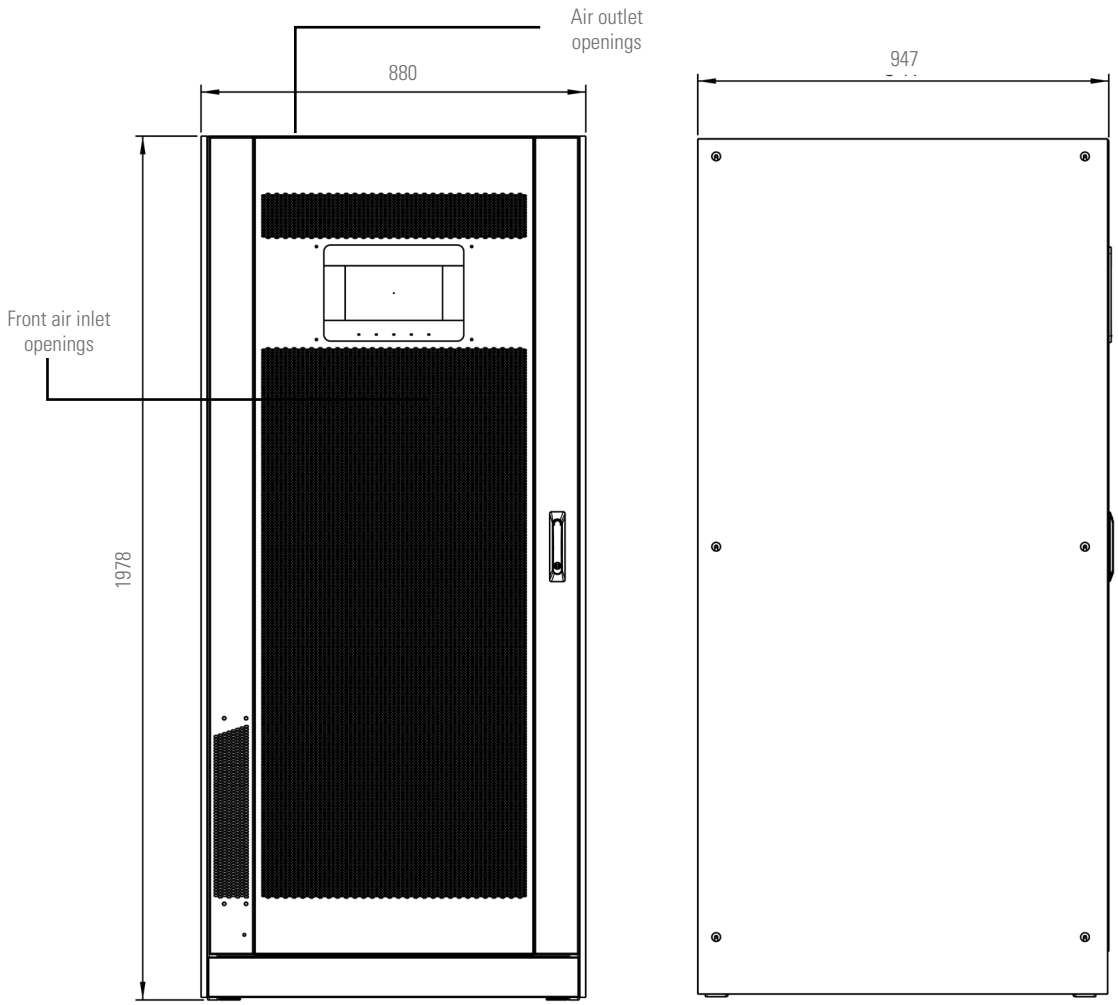



*Fig. 16. Dimensions of 200... 300 kVA devices.*

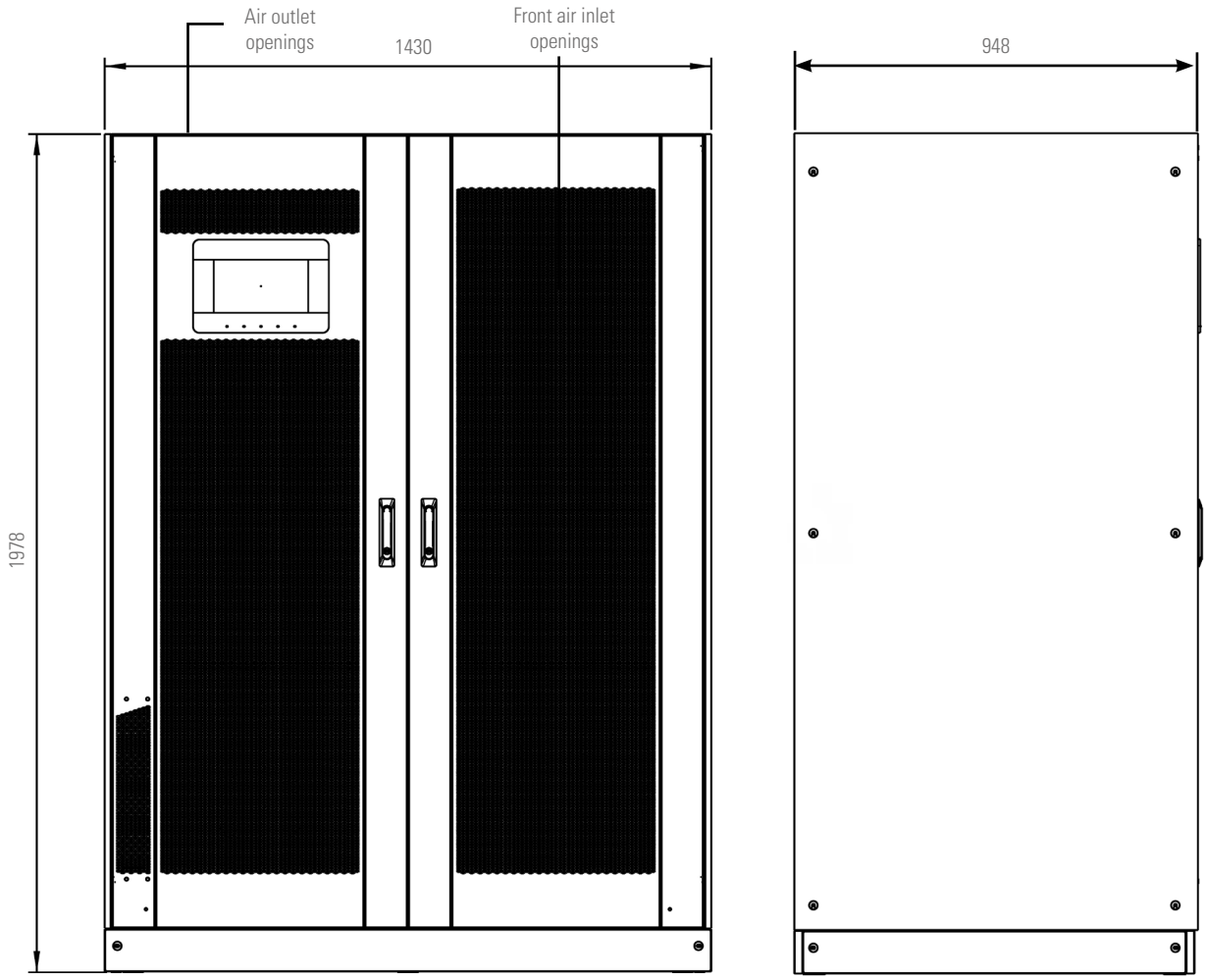



*Fig. 17. Dimensions of 400 kVA devices.*

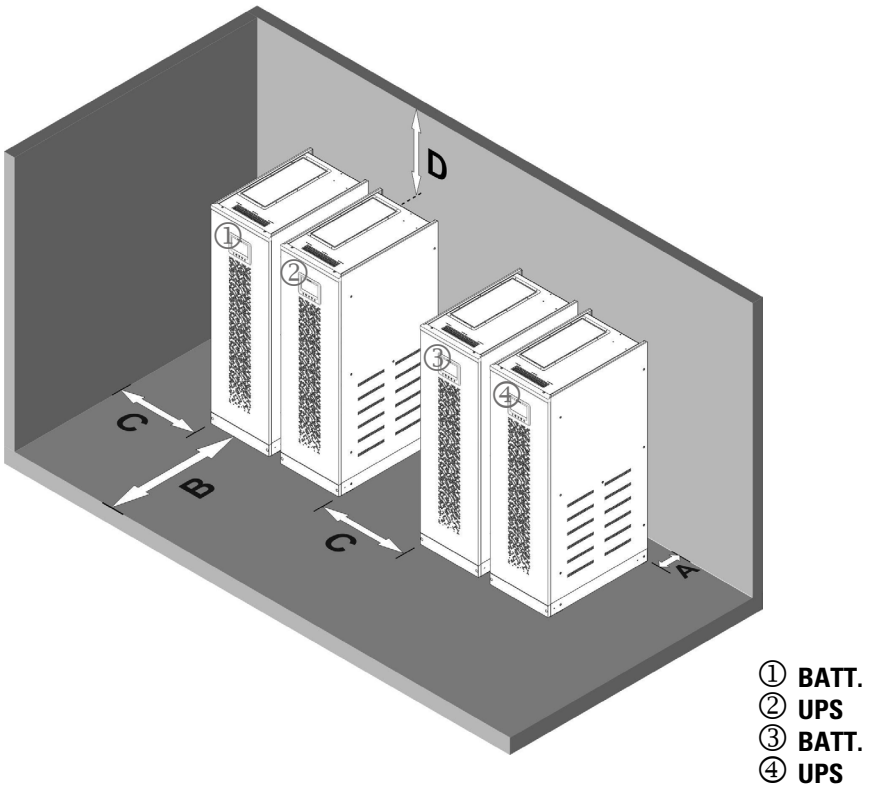



*Fig. 18. Recommended distances between the various cabinets and walls.*

The UPS must be installed in such a way as to ensure its serviceability and allow correct air flow as much as possible. Regarding minimum distances from walls, the recommended values are indicated below.

| | A (mm) | B (mm) | C (mm) | D (mm) |
|---|---|---|---|---|
| **UPS with internal batteries** | | | | |
| **Recommended spaces** | 50 | 1200 | 600 | 600 |
| **Minimum spaces** | 0 | 1200 | 600 | 400 |
| **UPS with external battery cabinet** | | | | |
| **Recommended spaces** | 50 | 1200 | 400 | 600 |
| **Minimum spaces** | 0 | 1200 | 0 | 400 |

*Table 2. Minimum and recommended spaces for 80... 160 kVA devices.*

| | A (mm) | B (mm) | C (mm) | D (mm) |
|---|---|---|---|---|
| **Recommended spaces** | 50 | 1200 | 50 | 600 |
| **Minimum spaces** | 0 | 1200 | 0 | 400 |

*Table 3. Minimum and recommended spaces for 200... 300 kVA devices.*

| | A (mm) | B (mm) | C (mm) | D (mm) |
|---|---|---|---|---|
| **Recommended spaces** | 50 | 1200 | 50 | 600 |
| **Minimum spaces** | 0 | 1200 | 0 | 400 |

*Table 4. Minimum and recommended spaces for 400 kVA devices.*

The following table shows the volume of air required for optimum ventilation and cooling of the UPS.

| **Power (kVA)** | **80** | **100** | **125** | **160** | **200** | **250** | **300** | **400** |
|---|---|---|---|---|---|---|---|---|
| **Air volume ($m^3/h$)** | 1200 | 1200 | 1500 | 1500 | 1800 | 2200 | 2300 | 4000 |

*Table 5. Volume of air required to properly ventilate the UPS.*

### 5.1.8. Environmental conditions of the installation.

Air is classified in standard EN 60721-3-3 (Classification of groups of environmental parameters and their severities, stationary use at non-weatherprotected locations), according to weather and biological conditions, as well as mechanically and chemically active substances.
The installation site must meet certain requirements to ensure compliance with the design conditions of the UPS.

- Weather conditions according to technical specifications:

| ENVIRONMENTAL PARAMETER | VALUE |
|---|---|
| **Minimum operating temperature (°C)** | -10 |
| **Maximum operating temperature (°C)** | +40 |
| **Minimum relative humidity (%)** | 5 |
| **Maximum relative humidity (%)** | 95 |
| **Condensation** | NO |
| **Precipitation with wind (water, snow, hail, etc.)** | NO |
| **Non-rain water** | NO |
| **Ice formation** | NO |

*Table 6. Environmental conditions of the UPS.*

- Classification of biological conditions (EN 60721-3-3):

| ENVIRONMENTAL PARAMETER | CLASS | | |
|---|---|---|---|
| | 3B1 | 3B2 | 3B3 |
| **Flora** | NO | Presence of mould, fungi, etc. | |
| **Fauna** | NO | Presence of rodents or other animals that may damage the device, excluding termites. | |

*Table 7. Biological conditions.*

- Classification of mechanically active substances (EN 60721-3-3):

| ENVIRONMENTAL PARAMETER | CLASS | | | |
|---|---|---|---|---|
| | 3S1 | 3S2 | 3S3 | 3S4 |
| **Sand ($mg/m^3$).** | No | 30 | 300 | 3000 |
| **Dust (suspension) ($mg/m^3$).** | 0.01 | 0.2 | 0.4 | 4.0 |
| **Dust (sedimentation) ($mg/(m^2 \cdot h)$).** | 0.4 | 1.5 | 15 | 40 |
| **Places where precautions have been taken to minimise the presence of dust. Places away from sources of dust or sand.** | X | | | |
| **Places without precautions to minimise the presence of sand or dust, but not near sources of sand or dust.** | | X | | |
| **Places close to sources of sand or dust.** | | | X | |
| **Places near work sites where sand or dust is produced, or in geographical areas with high presence of wind-borne sand or dust in the air.** | | | | X |

*Table 8. Classification of mechanically active substances.*

- Classification of chemically active substances (EN 60721-3-3).

| ENVIRONMENTAL PARAMETER | CLASS | | | | | |
|---|---|---|---|---|---|---|
| | 3C1R | 3C1L | 3C1 | 3C2 | 3C3 | 3C4 |
| **Marine salt.** | No | No | No | Salt spray | Salt spray | Salt spray |
| **Sulphur dioxide (mg/m³).** | 0.01 | 0.1 | 0.1 | 1.0 | 10 | 40 |
| **Hydrogen sulphide (mg/m³).** | 0.0015 | 0.01 | 0.01 | 0.5 | 10 | 70 |
| **Chlorine (mg/m³).** | 0.001 | 0.01 | 0.1 | 0.3 | 1.0 | 3.0 |
| **Hydrochloric acid (mg/m³).** | 0.001 | 0.01 | 0.1 | 0.5 | 5.0 | 5.0 |
| **Hydrofluoric acid (mg/m³).** | 0.001 | 0.003 | 0.003 | 0.03 | 2.0 | 2.0 |
| **Ammonia (mg/m³).** | 0.03 | 0.3 | 0.3 | 3.0 | 35 | 175 |
| **Ozone (mg/m³).** | 0.004 | 0.01 | 0.01 | 0.1 | 0.3 | 2.0 |
| **Nitrous oxide (in values equivalent to nitrogen dioxide) (mg/m³).** | 0.01 | 0.1 | 0.1 | 1.0 | 9.0 | 20 |
| **Places with a strictly monitored and controlled atmosphere ('clean space' category).** | X | | | | | |
| **Places with a continuously controlled atmosphere.** | | X | | | | |
| **Places in rural and urban areas with few industrial activities and moderate traffic.** | | | X | | | |
| **Places in urban areas with activities and/or heavy traffic.** | | | | X | | |
| **Places near factories with chemical emissions.** | | | | | X | |
| **Places inside industrial facilities. Emission of highly concentrated polluting chemical substances.** | | | | | | X |

*Table 9. Classification of chemically active substances.*

- The UPS is designed to be installed in an environment that meets the following classifications.

| | | |
|---|---|---|
| **K** | Weather conditions | According to technical data sheet |
| **B** | Biological conditions | 3B1 (EN 60721-3-3) |
| **C** | Chemically active substances | 3C2 (EN 60721-3-3) |
| **S** | Mechanically active substances | 3S2 (EN 60721-3-3) |

*Table 10. Characteristics of the location of the device.*

If the environmental conditions of the installation location do not meet the indicated requirements, it will be necessary to take additional precautions to reduce values in excess of the specified limits.

## 5.2. CONNECTIONS.

- A bad connection or switching operation can cause faults in the UPS and/or the loads connected to it. Read the instructions in this manual carefully and follow the steps indicated in the order established.

  The devices can be installed and used by personnel without specific training simply with the help of this manual.

  It should never be forgotten that a UPS is a generator of electrical energy, and, as such, the user must take all necessary precautions against direct or indirect contact.

  All of the device's connections, including those related to control (interface, EPO, etc.), must be made without mains power present and the UPS set to 'Off.'
- To connect a device to an optional battery module, or between modules, or to install an optional card in the slot, it is necessary to remove its respective protective metal cover screwed to the UPS. Remove the screws and cover.

### 5.2.1. Connection to the mains.

For electrical connection of 80... 400 kVA devices to the mains, connect the following cables:
- AC power from the rectifier and the bypass power supply.
- AC output of the loads.

**Risk of damage to the device due to insufficient isolation.**

The cables must be protected against short-circuits and current earth leakage.
The connection points must be hermetically sealed to prevent air from being sucked into the ducts where the cables are housed.

**Risk of damage to the device due to incorrect wiring.**

To connect the device, follow the electrical diagram carefully and respect the polarity of the cables.

Information about each device's cables and the input's protection fuses is presented below.

| Power (kVA) | 80 | 100 | 125 | 160 | 200 | 250 | 300 | 400 |
|---|---|---|---|---|---|---|---|---|
| **INPUT FUSES (A)** | | | | | | | | |
| **Rectifier** | 160 | 200 | 225 | 315 | 355 | 425 | 500 | 800 |
| **Bypass** | 125 | 160 | 200 | 250 | 300 | 400 | 500 | 630 |
| **PHASE CONDUCTOR CROSS SECTION (mm²)** | | | | | | | | |
| **Rectifier** | 4x (1x70) | 4x (1x95) | 4x (1x95) | 4x (1x150) | 4x (1x185) | 4x (1x240) | 4x (2x185) | 4x (2x240) |
| **Bypass** | 4x (1x50) | 4x (1x70) | 4x (1x95) | 4x (1x120) | 4x (1x150) | 4x (1x240) | 4x (2x150) | 4x (2x185) |
| **Output** | 4x (1x50) | 4x (1x70) | 4x (1x95) | 4x (1x120) | 4x (1x150) | 4x (1x240) | 4x (2x150) | 4x (2x185) |
| **Batteries** | 3x (1x70) | 3x (1x95) | 3x (1x95) | 3x (1x150) | 3x (1x185) | 3x (2x150) | 3x (2x185) | 3x (2x240) |
| **Earth conductor cross section (mm²)** | 35 | 50 | 50 | 95 | 95 | 150 | 185 | 240 |
| **CONNECTION TO THE MAINS** | | | | | | | | |
| **Type** | Screw terminals | | | | Aluminium bars | | | |
| **Max. conductor cross section (mm²)** | 95 | | 150 | | 185 | 240 | | |
| **No. of conductors** | 1 (2) | | 2 | | | | | |
| **Fixing screws** | - | | M12 | | | | | |
| **Tightening torque (Nm)** | 8... 15 | | 69... 85 | | | | | |

*Table 11.* ***Cable cross section and input fuses.***

The cross sections indicated in the table above are only indicative. For their dimensioning, standard UNE 20460-5-523 has been taken into account.

## Terminals.

The SLC X-PERT UPS is equipped with terminals for the connection of power cables and auxiliary connections.

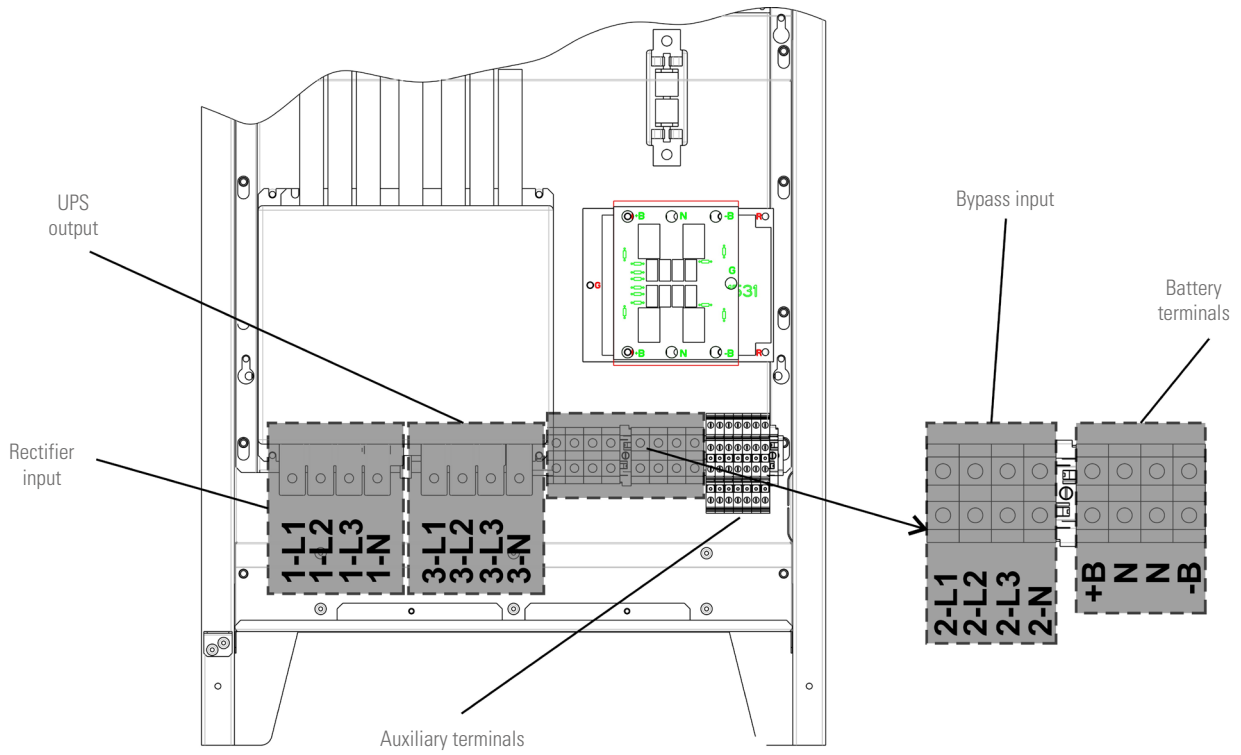



*Fig. 19.* ***Terminals for 80 kVA devices.***

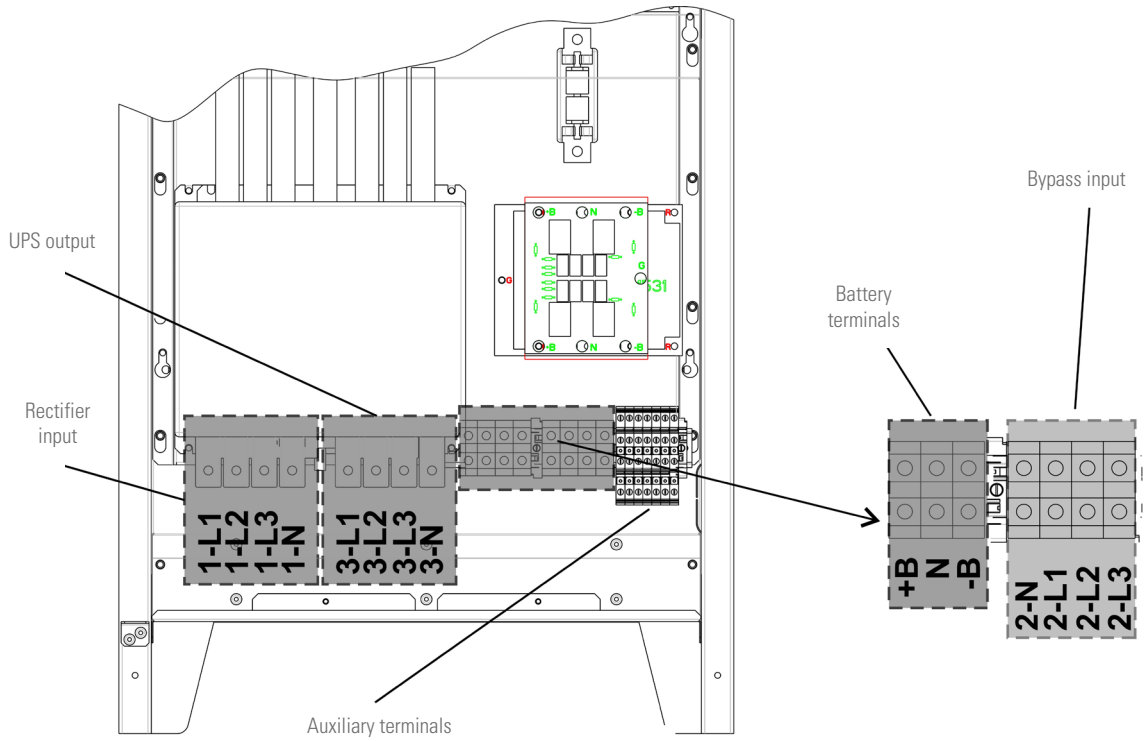



*Fig. 20.* ***Terminals for 100 kVA devices.***

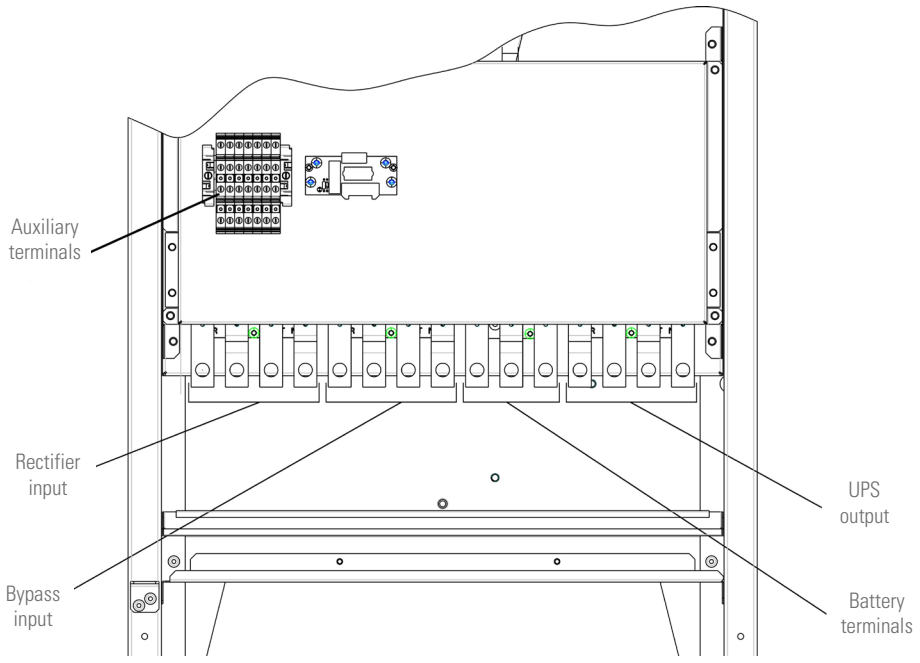



*Fig. 21.* ***Terminals for 125 and 160 kVA devices.***

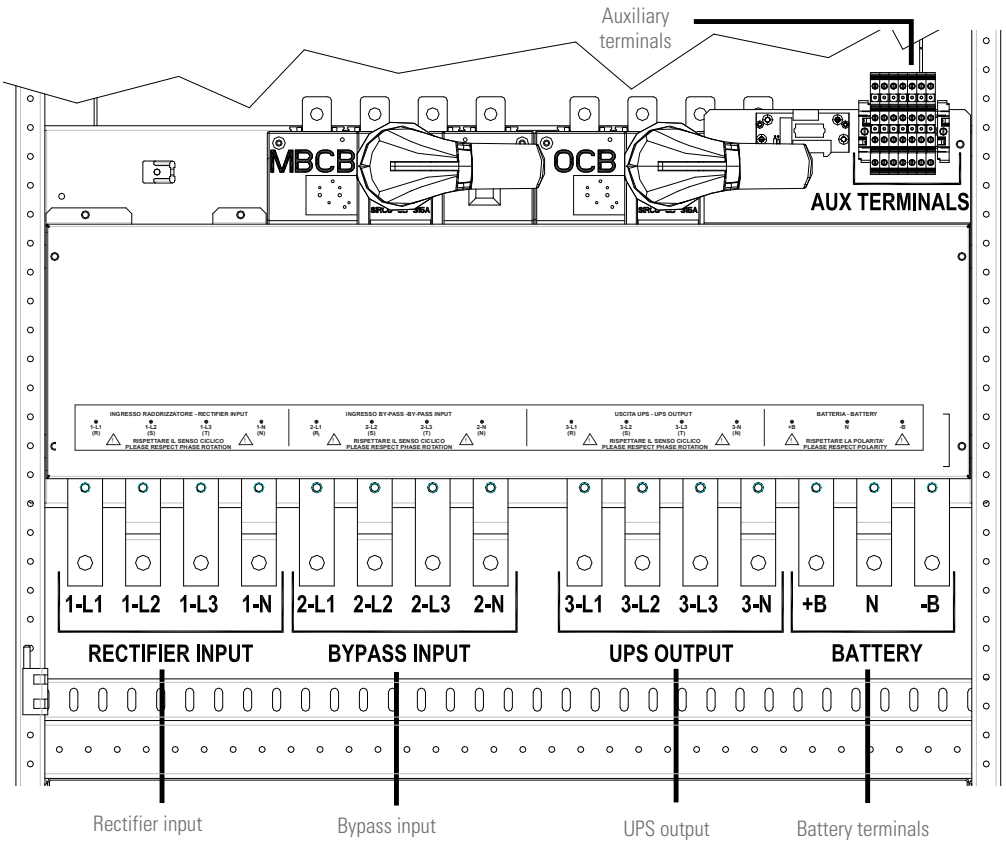



*Fig. 22. Terminals for 200 and 250 kVA devices.*

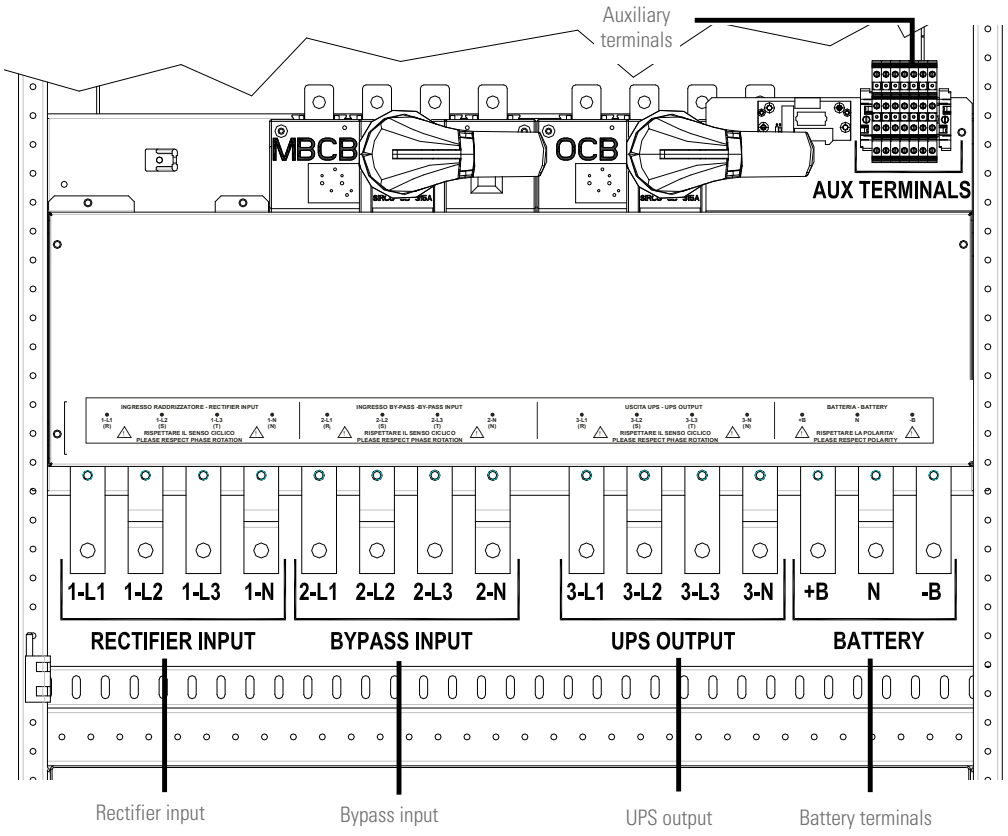



*Fig. 23. Terminals for 300 kVA devices.*

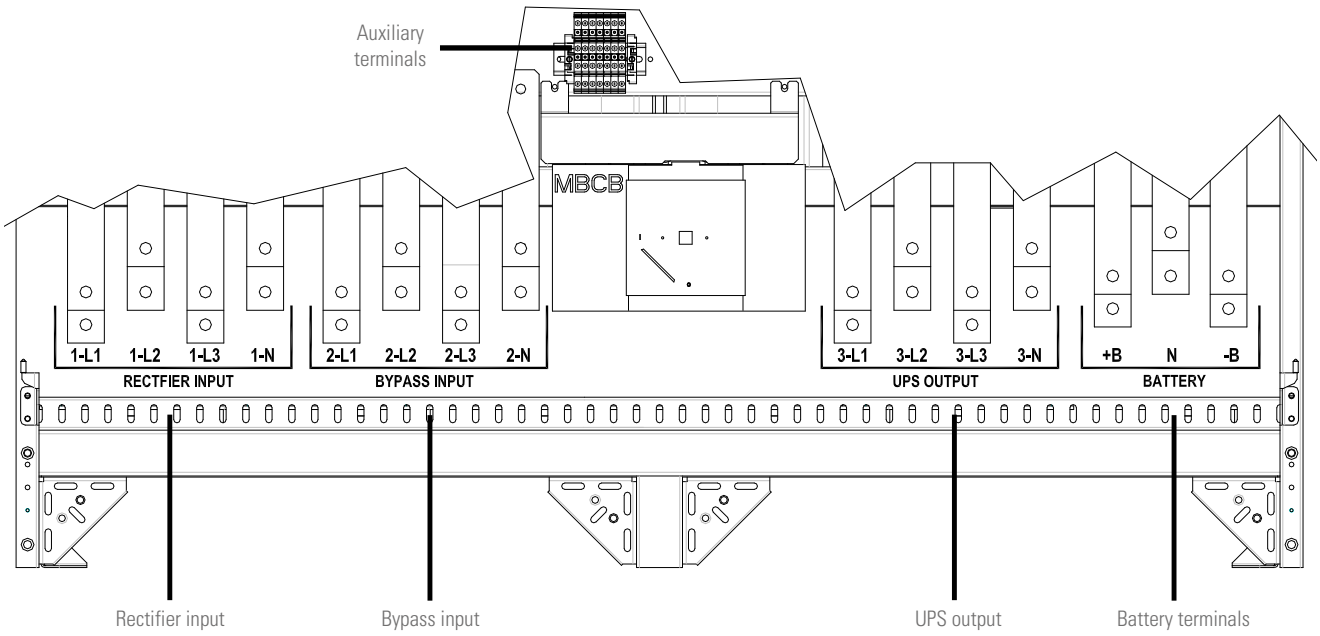



*Fig. 24. Terminals for 400 kVA devices.*

### 5.2.2. Battery connection.

**Risk of electric shock.**
Batteries pose a risk of electric shock and high short-circuit current. The following precautions must be taken:

- Remove any watches, rings or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not place tools or metal objects on top of the batteries.
- Disconnect the load source before connecting or disconnecting the battery terminals.
- Make sure that the batteries are connected to earth. Contact with any part of an earthed battery can cause an electric shock.

**Follow the installation instructions.**
For the installation of the batteries, strictly observe standard EN 62040-1.
To ensure the service life of the batteries indicated by the manufacturer, the operating temperature should remain between 0 and 25 °C. Batteries can, however, work up to 40 °C, with a significant reduction of its service life.
In order to avoid the formation of any kind of mixture of hydrogen and potentially explosive oxygen, adequate ventilation must be ensured (see EN 62040-1 Annex M).

The batteries can be internal or external in the case of 80 kVA devices, and only external in the case of 100... 400 kVA devices. It is recommended to install them at the moment the UPS is ready to charge them. Note that, if the batteries are not charged for periods of more than 3 to 4 months, they can suffer irreparable damage.

**Auxiliary contact of the external battery switch.**
For correct operation of the UPS, it is recommended to connect the auxiliary contact of the external battery switch to terminals X10-9/10.

**Battery voltage.**
After installing the batteries and before turning the BCB switch 'On,' check the voltage of the batteries on the BCB switch. If the wiring is not powered directly, connect the cables of the battery switch (BCB) as shown in the following figure. The cables are not supplied by the manufacturer.

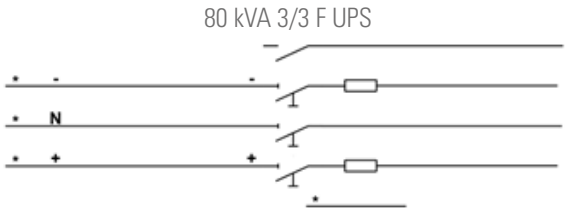



*Fig. 25. Wiring of the BCB switch fuse holder.*

- **80 kVA device: installation of 12 V and 7-9-11 Ah batteries.**
  - ❒ Remove the 6 screws to open the left/right side cover and access the battery tray (there are a total of 6 trays, each containing 3 rows of 10 batteries).

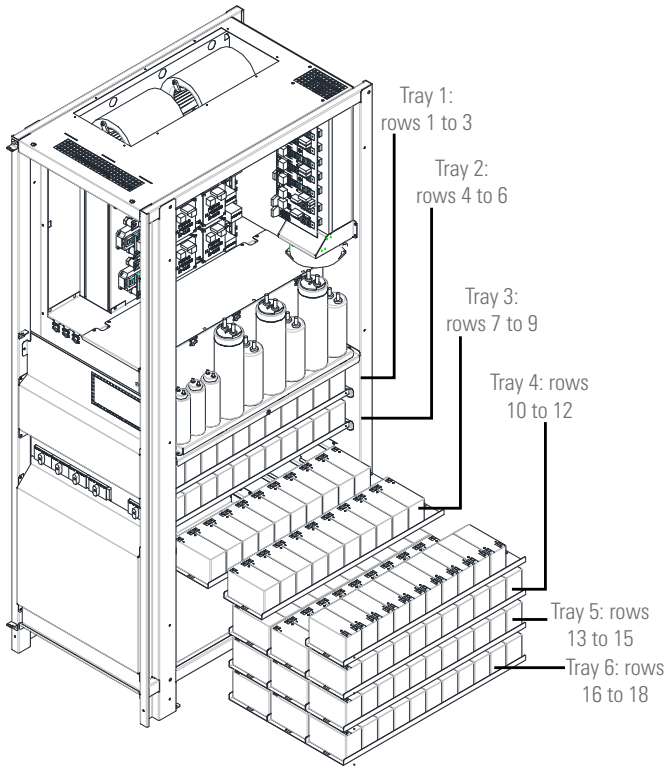



*Fig. 26. Side view of the battery trays (12 V, 7-9-11 Ah)*

  - ❒ Install the batteries received in separate packages as indicated in Fig. 27 and Fig. 29:

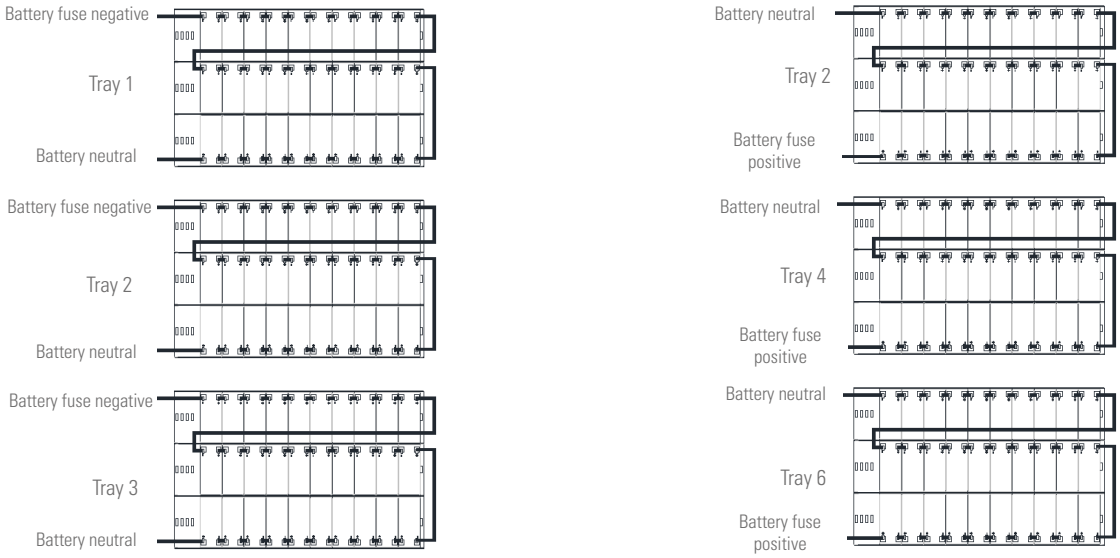



*Fig. 27. Top view of the battery connection tray (12 V, 7-9-11 Ah).*

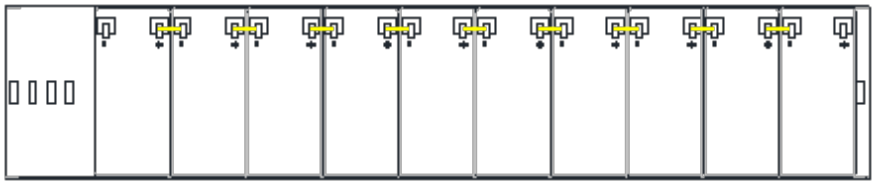


*Fig. 28. Top view of a row of batteries (12 V, 7-9-11 Ah).*

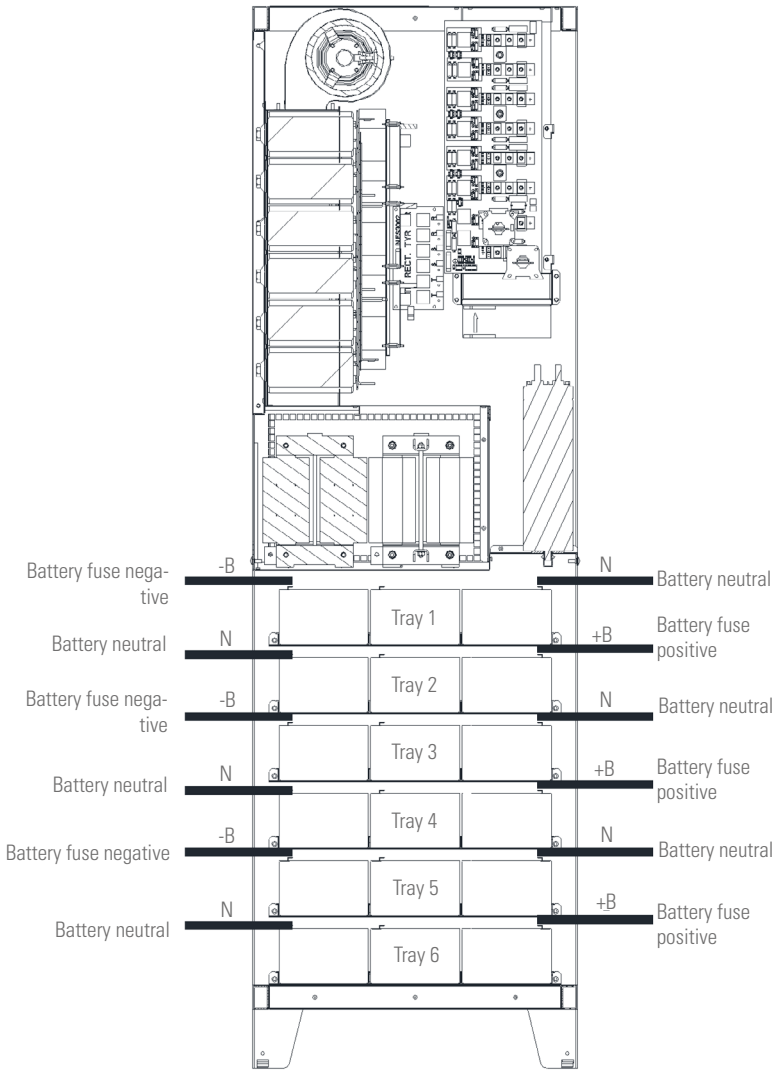



*Fig. 29. Front view of the battery connection tray (12 V, 7-9-11 Ah).*

- ❒ After connection, slide the trays back into the UPS.
- ❒ Replace and fix the left/right cover with the screws supplied.

- **80 kVA devices: installation of 12 V and 12-14 Ah batteries.**
  - ❒ Remove the 6 screws to open the left/right side cover and access the battery trays (there are a total of 6 trays and each contains 2 rows of 7 batteries, and a row of 6 batteries).

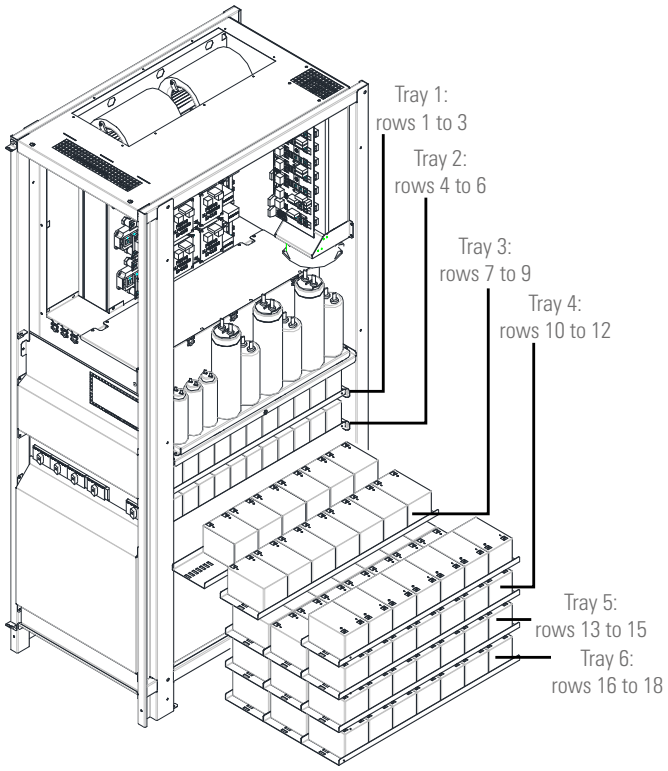



*Fig. 30. Side view of the battery trays (12 V, 12-14 Ah)*

  - ❒ Install the batteries received in separate packages as indicated in Fig. 31 and Fig. 33.

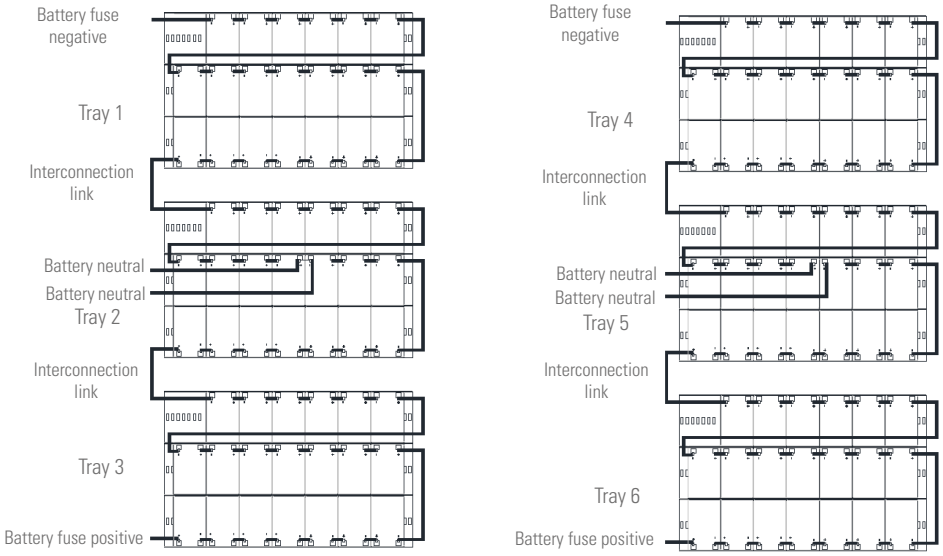



*Fig. 31. Top view of the battery connection tray (12 V, 12-14 Ah).*

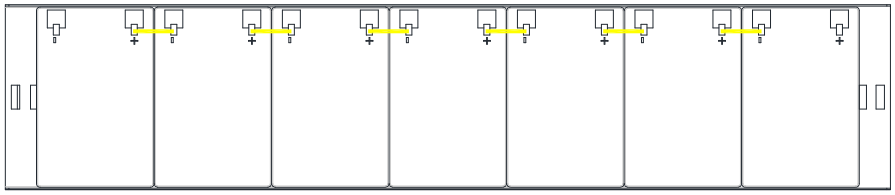


*Fig. 32. Top view of a row of batteries (12 V, 12 -14 Ah).*

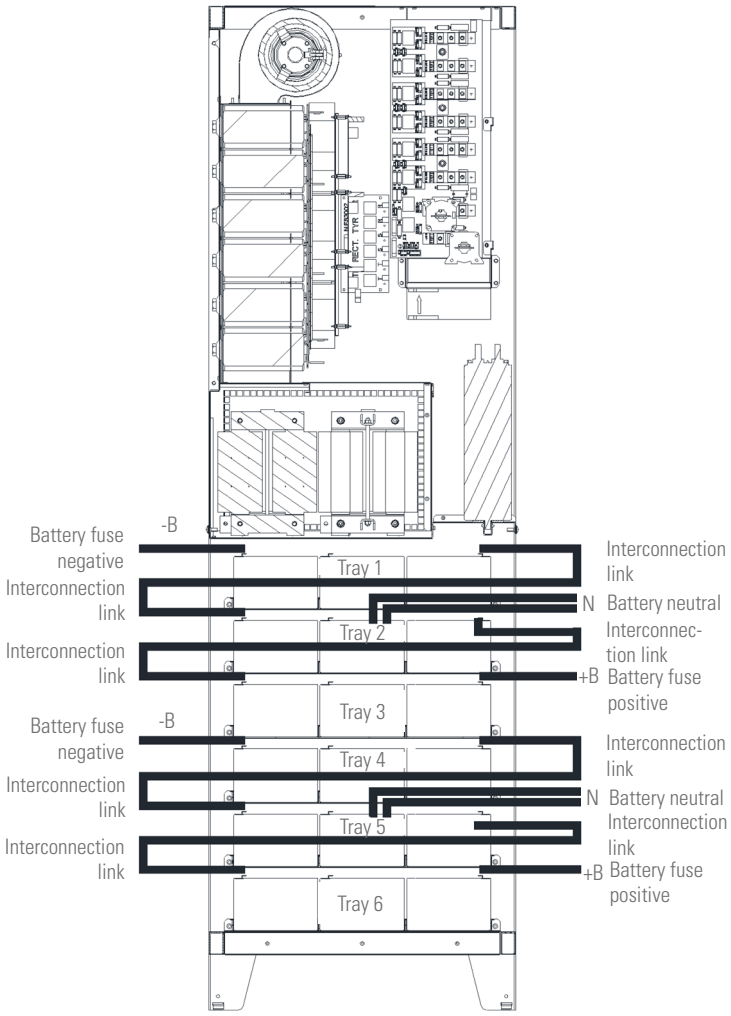



*Fig. 33. Top view of the battery connection tray (12 V, 12-14 Ah).*

- ❒ After connection, insert the trays back into the UPS.
- ❒ Replace and fix the left/right cover with the screws.

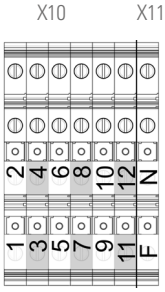
### 5.2.3. Connection of the auxiliary cables.

SLC X-PERT UPS units can be connected to controls/external components specifically designed to improve the safety and reliability of the device. The following auxiliary connections can be made in the UPS:

- External manual bypass (MBCB).
- External Normal/Bypass selector.
- External output switch (OCB).
- Emergency power off button (EPO).
- Auxiliary batteries contact (BCB).
- Diesel generator.

Auxiliary cables must be connected to specific terminals. Cables up to 4 $mm^2$ can be connected.

**Auxiliary contacts of OCB, MBCB and BCB.**
The auxiliary contacts of these switches must be connected to the UPS.




| | |
|---|---|
| 1-2 | MBCB |
| 3-4 | BYP switch |
| 5-6 | OCB |
| 7-8 | EPO |
| 9-10 | BCB |
| 11-12 | Diesel generator |
| F-N | Backfeed protection contact |

*Fig. 34. **SLC X-PERT UPS auxiliary terminals.***

5.2.3.1. External manual bypass.

The auxiliary contacts are located in terminals X10-1/2. A normally open contact is required; when it is closed, the microprocessor will obtain the status of the contact and turn off the inverter.

5.2.3.2. Normal/Bypass selector.

The auxiliary contacts of this selector are located in terminals X10-3/4. When the contact is closed, the UPS will transfer the load from the inverter to the bypass.

5.2.3.3. External output switch.

The auxiliary contacts are located in terminals X10-5/6. This contact is necessary to indicate the position of the disconnector. If the external switch has not been provided, short-circuit terminals 5 and 6.

5.2.3.4. Remote emergency power off button.

The auxiliary contacts are located in terminals X10-7/8. The supply of voltage to the loads can be interrupted from a remote location by using this contact. A normally closed contact is required; when it is open, the static inverter and bypass switches will open and the output power supply will be interrupted.

If the external EPO switch has not been provided, short-circuit terminals 7 and 8.

5.2.3.5. Auxiliary batteries contact.

The auxiliary contacts are located in terminals X10-9/10. This contact is necessary to indicate the position of the disconnector (open-closed).

5.2.3.6. Auxiliary diesel generator contact.

The auxiliary contacts are located in terminals X10-11/12. A normally open contact must be used; the contact must be closed when the diesel generator is operating. The microprocessor will acquire the state of the contact, and when the rectifier is started, it will enable operation in 'Diesel Mode,' in which operation is with DC voltage reduced to decrease the power extracted from the AC line.

### 5.2.4. Serial interface.

The UPS is equipped with serial interfaces and external connection ports for communication of operating status and parameters.

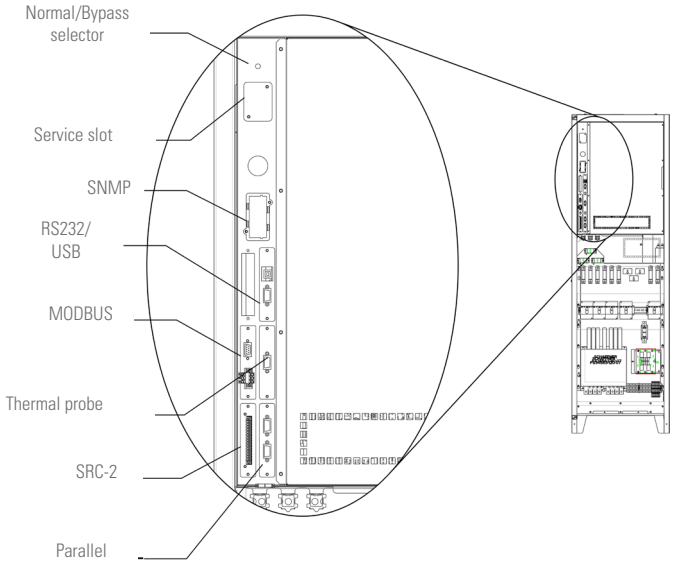



*Fig. 35. **Position of the serial interfaces of 80... 160 kVA devices.***

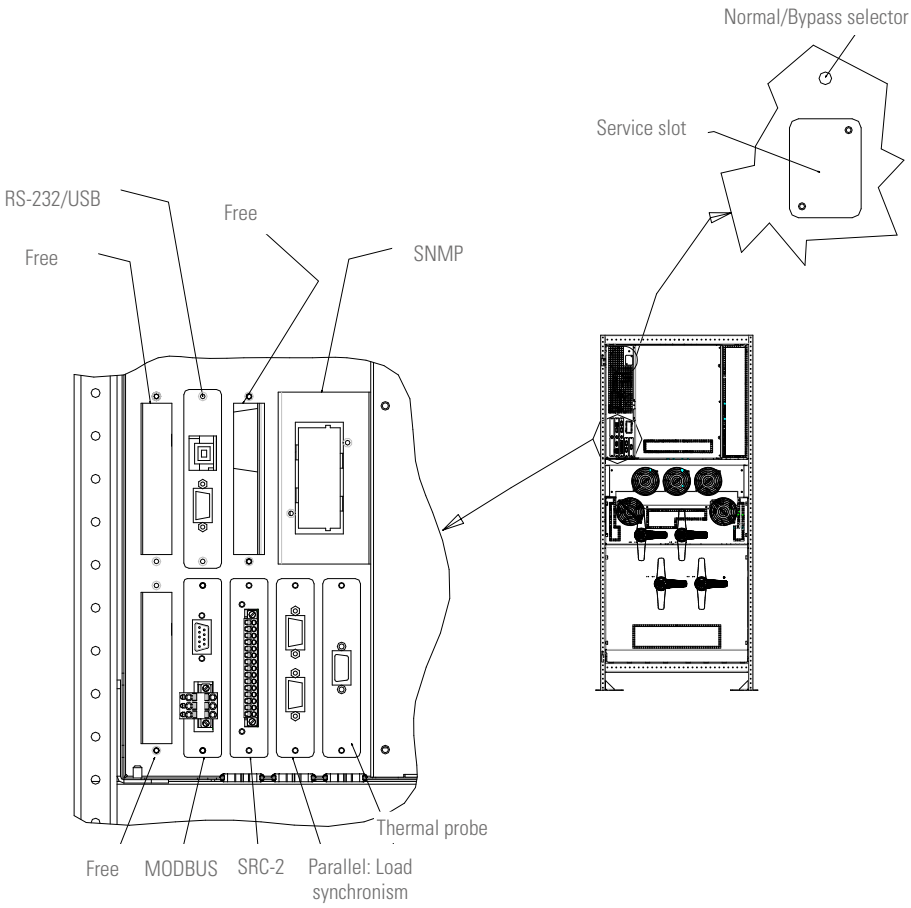



*Fig. 36.* ***Position of the serial interfaces of 200... 300 kVA devices.***

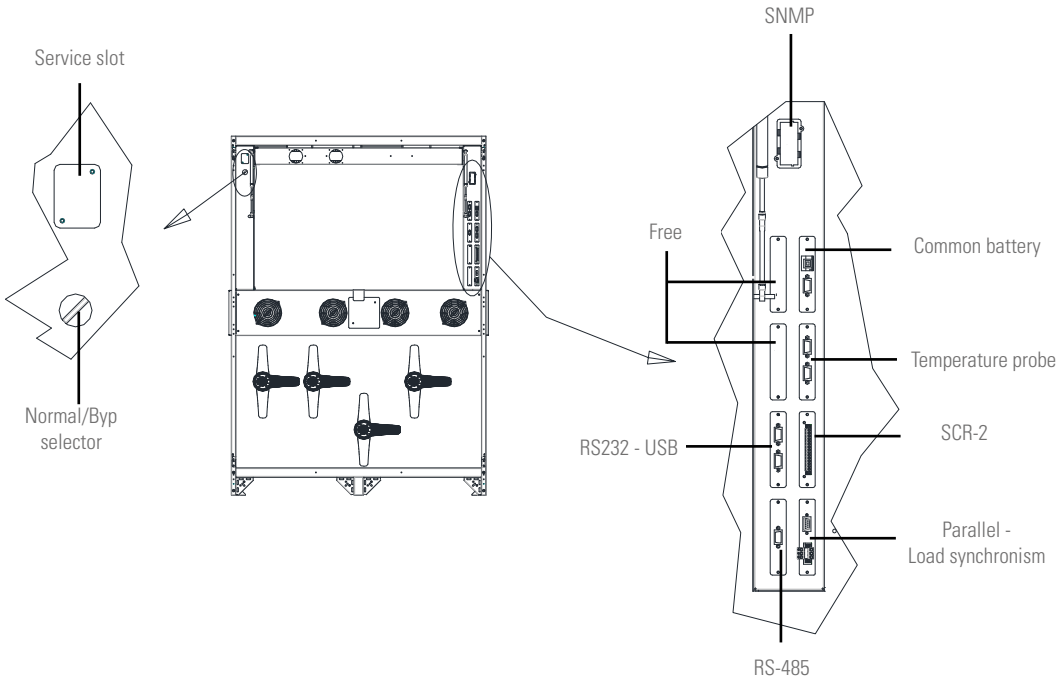



*Fig. 37.* ***Position of the serial interfaces of 400 kVA devices.***

The external connection ports shown in the previous figures are described below:

- **RS232/USB**: for connection to proprietary programming and control software.
- **SRC-2 (optional)**: relay card used for remote signalling of states and alarms.
- **Parallel (optional)**: used for parallel UPS communication.
- **MODBUS (optional)**: used for the transmission of data to the outside through the MODBUS RTU protocol (RS485).
- **Thermal probe (optional)**: used to measure the temperature of the cabinet/battery room and adjust the charging voltage automatically.
- **SNMP (optional)**: used for the external transmission of data through a LAN.
- **Normal/Bypass selector**.

### 5.2.5. Relay interface connection.

The SLC X-PERT UPS, in its complete configuration, is equipped with a 5-relay interface in order to transmit alarms and operating states remotely. The electrical connection is made directly to the terminals located on the front of the SRC-2 interface slot.

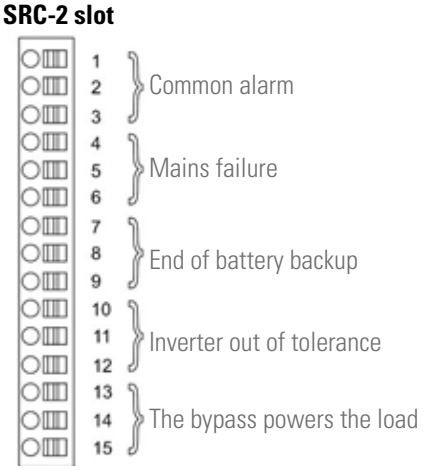



*Fig. 38. Relay interface terminals.*

Relay output specifications: 250 V AC (1 A); 30 V DC (1 A).

| RELAY | ALARM/STATES | STATES | M1 | LED | | |
|---|---|---|---|---|---|---|
| | | | PINS | STATE IN NORMAL OPERATION | NAME | STATE IN NORMAL OPERATION |
| **RL1** | A30: Common alarm | No voltage if there is an alarm | 2-3 | Closed | DL1 | ON |
| | | | 1-2 | Open | | |
| **RL2** | A1: Input failure | No voltage if there is an alarm | 5-6 | Closed | DL2 | ON |
| | | | 4-5 | Open | | |
| **RL3** | A9: End of battery backup | No voltage if there is an alarm | 8-9 | Closed | DL3 | ON |
| | | | 7-8 | Open | | |
| **RL4** | A13: Inverter out of tolerance | No voltage if there is an alarm | 11-12 | Closed | DL4 | ON |
| | | | 10-11 | Open | | |
| **RL5** | Normal mode<br>A16: Bypass → load | No voltage if there is an alarm | 13-14<br>14-15 | Closed<br>Open | DL5 | ON |
| | ECO mode<br>S7 state: Bypass → load | With voltage if there is state | 14-15<br>13-14 | Closed<br>Open | | |

*Table 12. Relays available in the relay interface.*

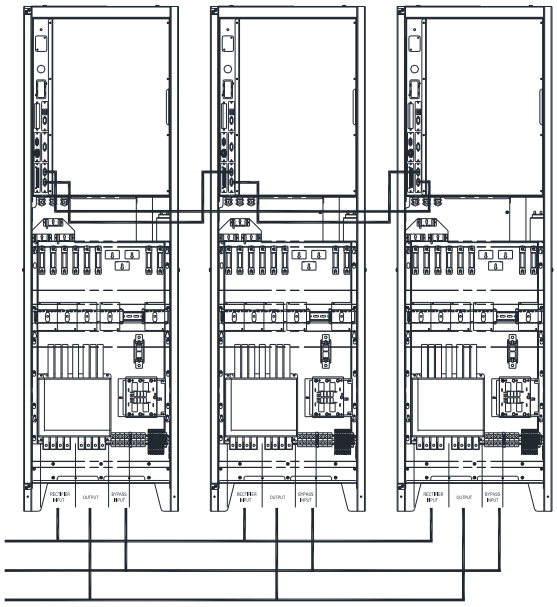


*Fig. 39. Connection of three UPSs through the CAN bus for 80... 100 kVA devices.*

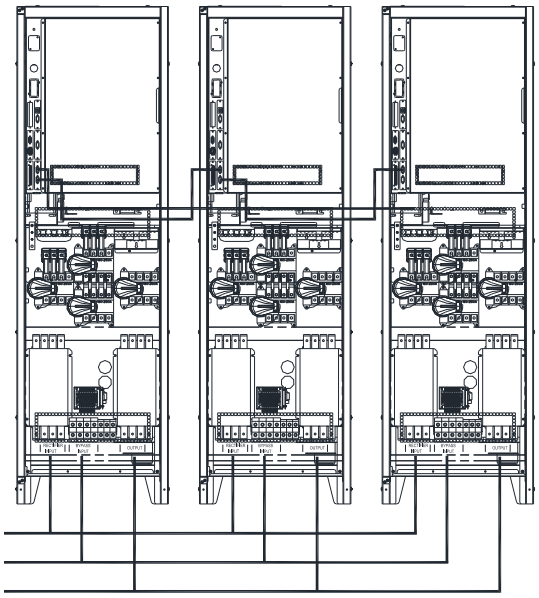


*Fig. 40. Connection of three UPSs through the CAN bus for 125... 160 kVA devices.*

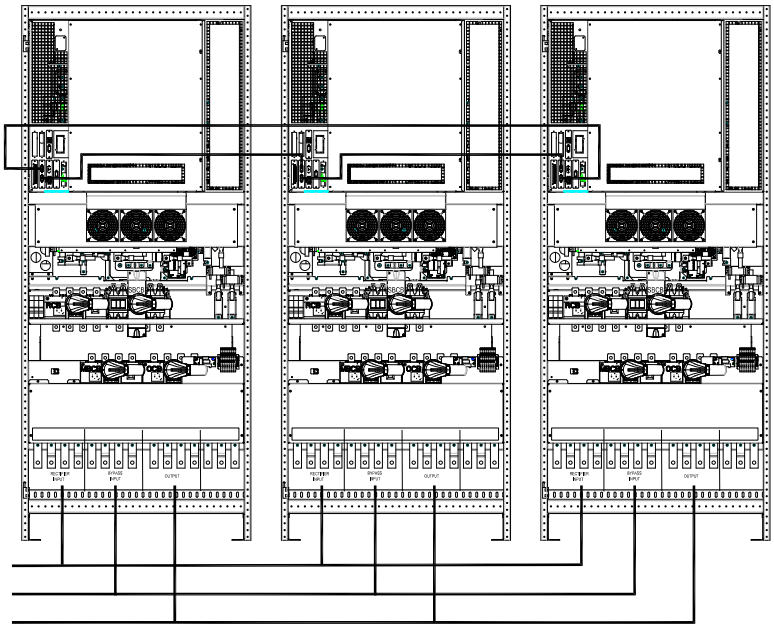


*Fig. 41. Connection of three UPSs through the CAN bus for 200... 300 kVA devices.*

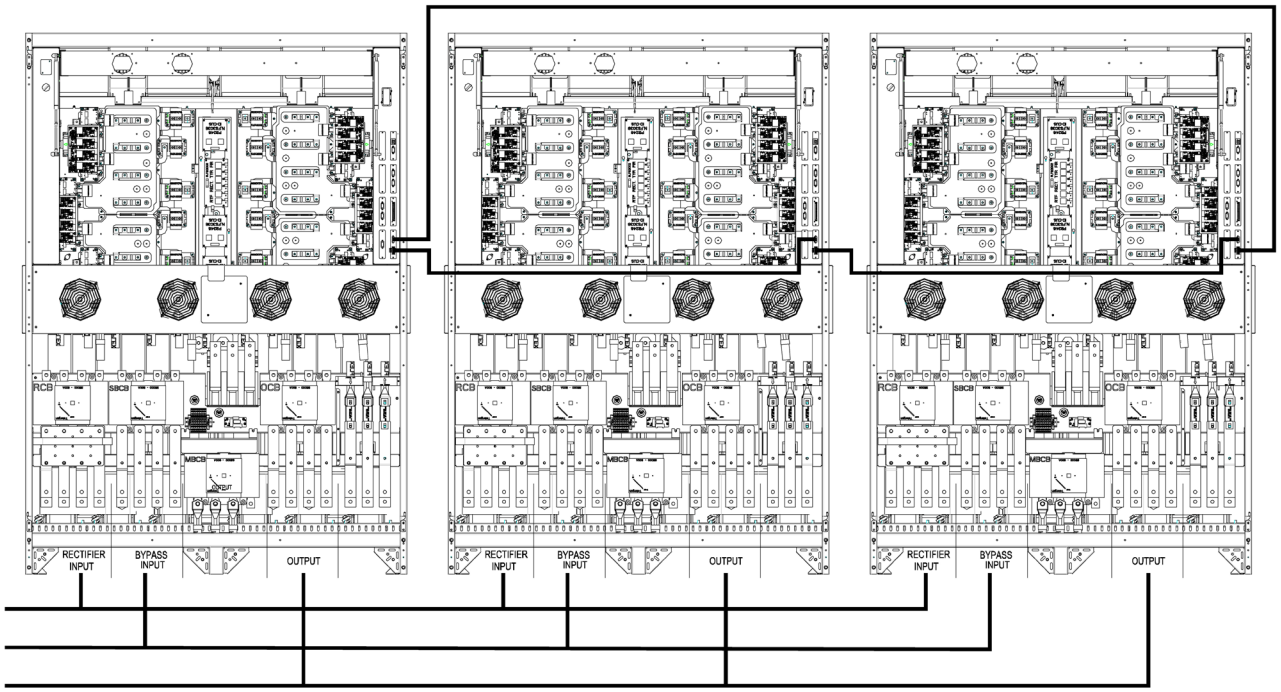



*Fig. 42. Connection of three UPSs through the CAN bus for 400 kVA devices*

### 5.2.6. Connection of UPSs in parallel.

Before proceeding to install a parallel UPS system, read section 6 ("OPERATION") carefully for each individual unit, and take into account all of the information regarding:

- Reception of the UPS.
- Dimensions and weights.
- Location distances.
- Cable cross section and the size of the fuses and terminals.

⚠ To connect the UPSs in parallel, we recommend using cables of the same length and cross section for both input and output(see Fig. 39 to Fig. 42), in accordance with the units' power.

The parallel systems communicate via the CAN-BUS-cable that comes with the devices to be set up in parallel (one cable per device). Thus, beginning with the first device, one end of the cable is connected to "PAR CAN-OUT", and the other to the "PAR CAN-IN" of the second device. For systems comprising a greater number of devices, connect the "PAR CAN-OUT" of one device to the "PAR CAN-IN" of the next device, and so on. Finally, you must close the "circuit" of communication by connecting the "PAR CAN-OUT" cable on the last device to the "PAR CAN-IN" on the first device.

⚠ Pay close attention when connecting the CAN-BUS cable to the DB9 port corresponding to the SLOT-PAR card, to make sure you do not confuse it with any of the other DB9 connectors on the device's interface.

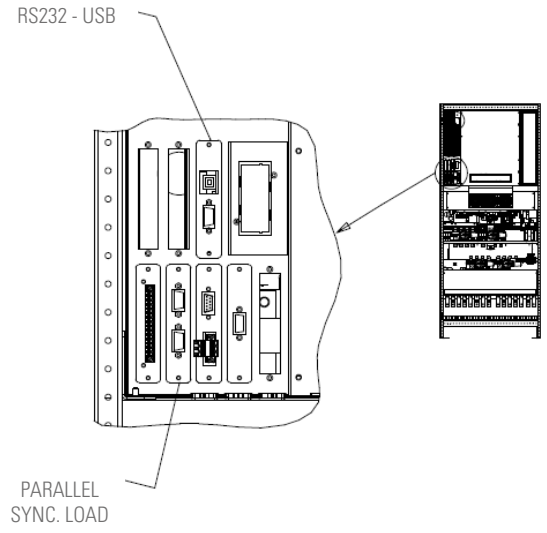



*Fig. 43. Connecting the CAN-BUS cables to the "PARALLEL" card (SYNC LOAD).*

### 5.2.7. Connecting UPSs in parallel with a common bank of batteries (optional).

Before proceeding to install a common battery, read section "6. OPERATION." carefully for each of the individual units, taking into account all of the information regarding:

- Reception of the UPS.
- Dimensions and weights.
- Location distances.
- Cable cross section and the size of fuses and terminals.

#### 5.2.7.1. Location and connection.

We recommend positioning the two UPS units at least 10 cm apart, in order to leave space for the signal and power cables.

⚠ To connect the UPSs in parallel, we recommend using cables of the same length and cross section for both the input and output (see Fig. 46 to Fig. 49), in accordance with the units' power.

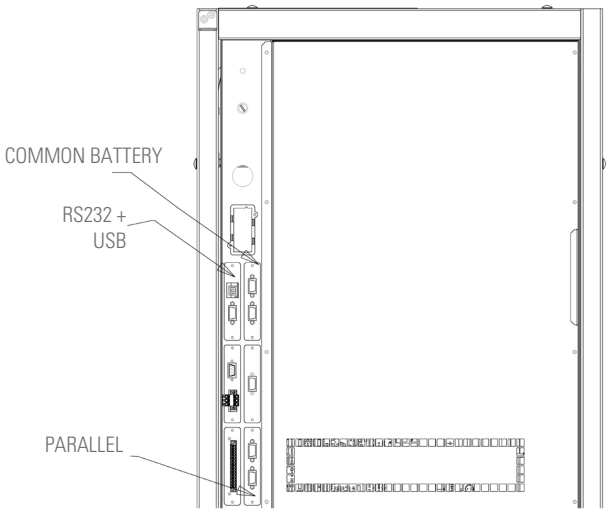



*Fig. 44. Location of common battery in SLC X-PERT 80 - 160 kVA.*

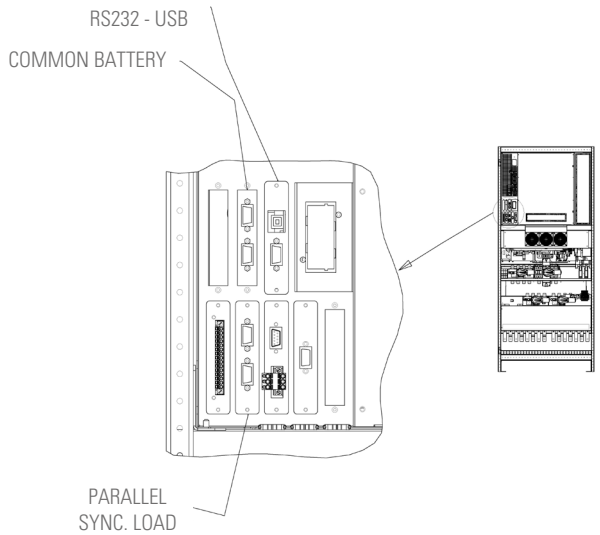



*Fig. 45. Location of common battery in SLC X-PERT 200 - 250 - 300 kVA.*

Finally, attach the CAN cable to connect the units to each other. Attach each cable to the CAN-IN connector on one UPS and to the CAN-OUT connector on the other, thereby forming a circuit. The CAN-IN and CAN-OUT contacts are identical.

⚠ Check to make sure the parallel BUS-CAN cable is connected to the DB9 connector on the SLOT-PAR card for the common battery. An incorrect connection could cause damage to the interface and/or the UPS.
Make sure you do not confuse the SLOT-PAR parallel card with the SLOT-PAR-RECT for the common battery.

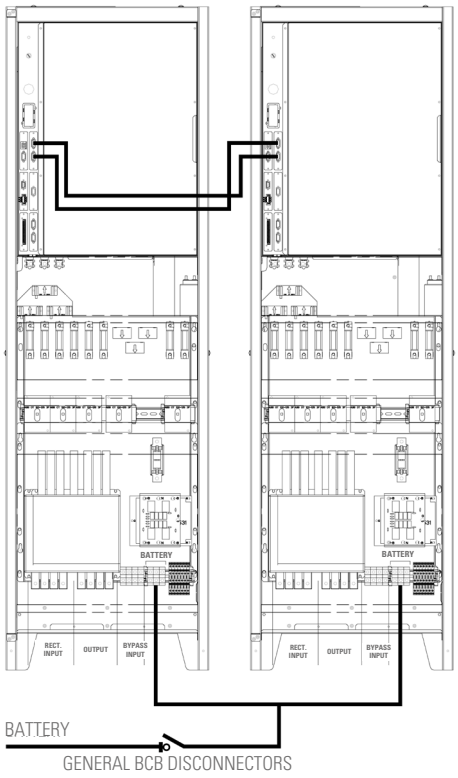



*Fig. 46.* ***BUS-CAN common battery connection in SLC X-PERT 80 kVA.***

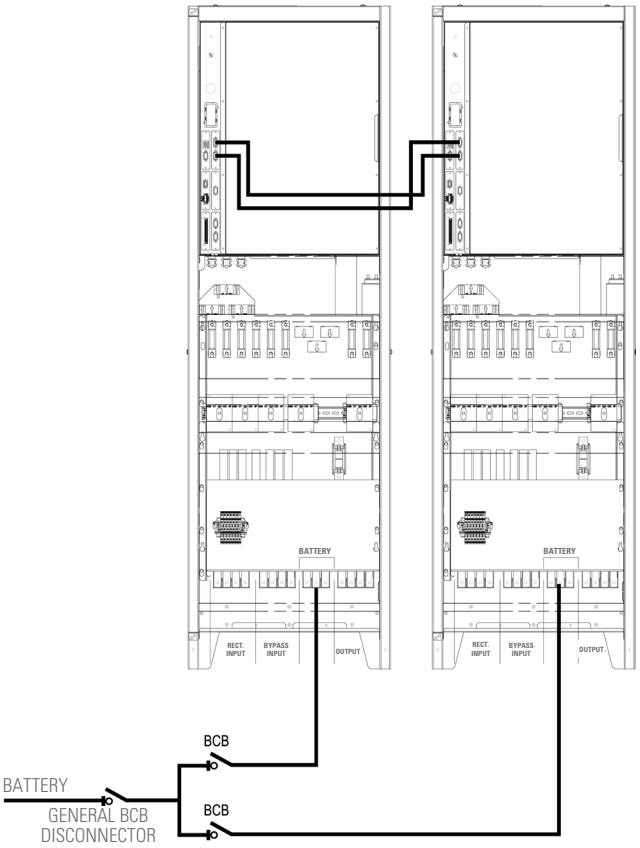



*Fig. 48.* ***BUS-CAN common battery connection in SLC X-PERT 125 - 160 kVA.***

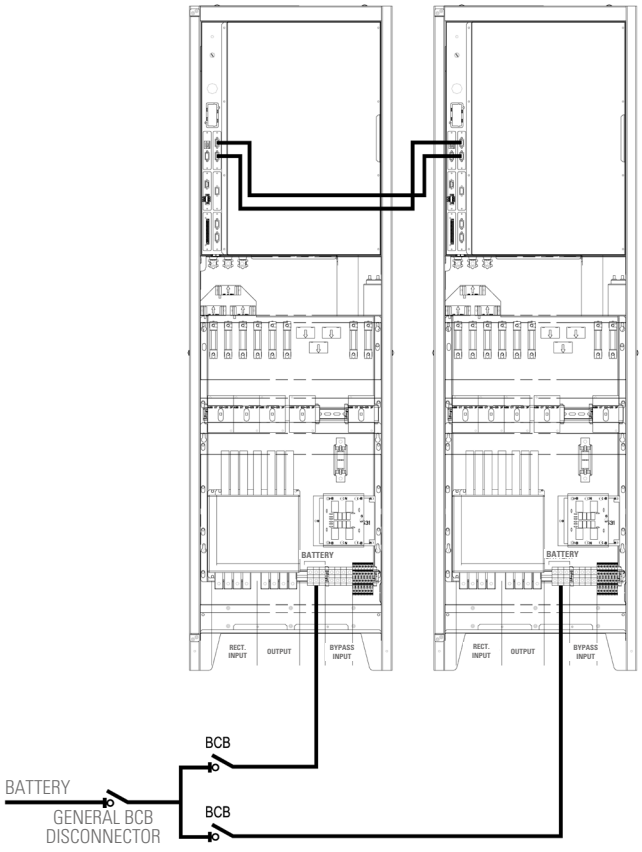



*Fig. 47.* ***BUS-CAN common battery connection in SLC X-PERT 100 kVA.***

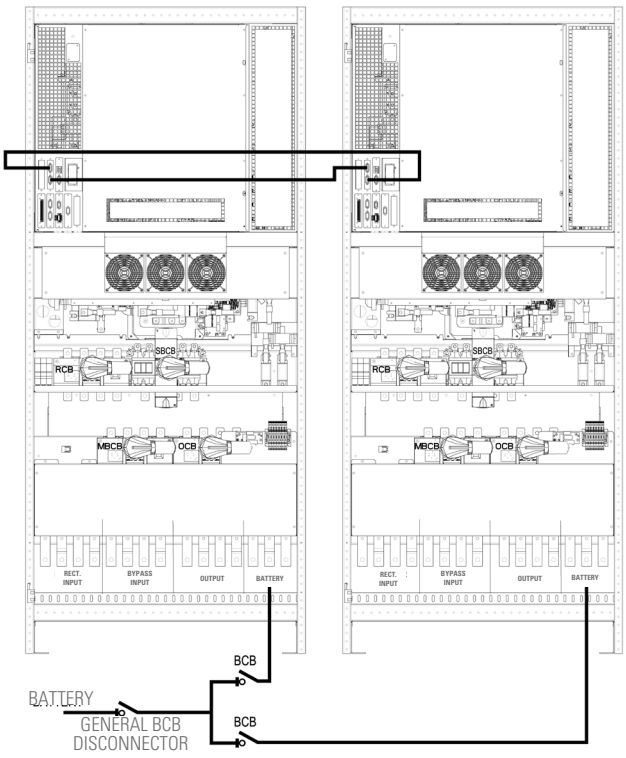



*Fig. 49.* ***BUS-CAN common battery connection in SLC X-PERT 200 - 250 - 300 kVA.***

The position of the input on the SLC 100 X-PERT is different to that of the SLC 125 X-PERT and the SLC 160 X-PERT. Consult the relevant section in this manual and the specific identification labels located near the power terminal block in order to identify the battery input.

We recommend that you first connect the UPS battery inputs to the external BCB disconnectors, followed by the common BCB-CAB disconnector, using cables of the same length and cross section.
The external BCB disconnectors must have an auxiliary contact in order to monitor the status of the thermal-magnetic circuit breaker, which must be connected to the specific BCB-AUX terminals on the UPS.

5.2.7.2. Battery connection.

For a system with a common battery, the battery must be connected as follows, in accordance with the power of the device:

- The SLC 80 X-PERT units are equipped with an **integrated BCB disconnector**, directly connecting the output of the battery cabinet disconnector (GENERAL BCB) to the battery input on the two UPSs. In order to connect them to the BCB-AUX input, the battery cabinet disconnector must be equipped with a "normally open" contact for each UPS. Battery connection should be carried out as shown in the following diagram:

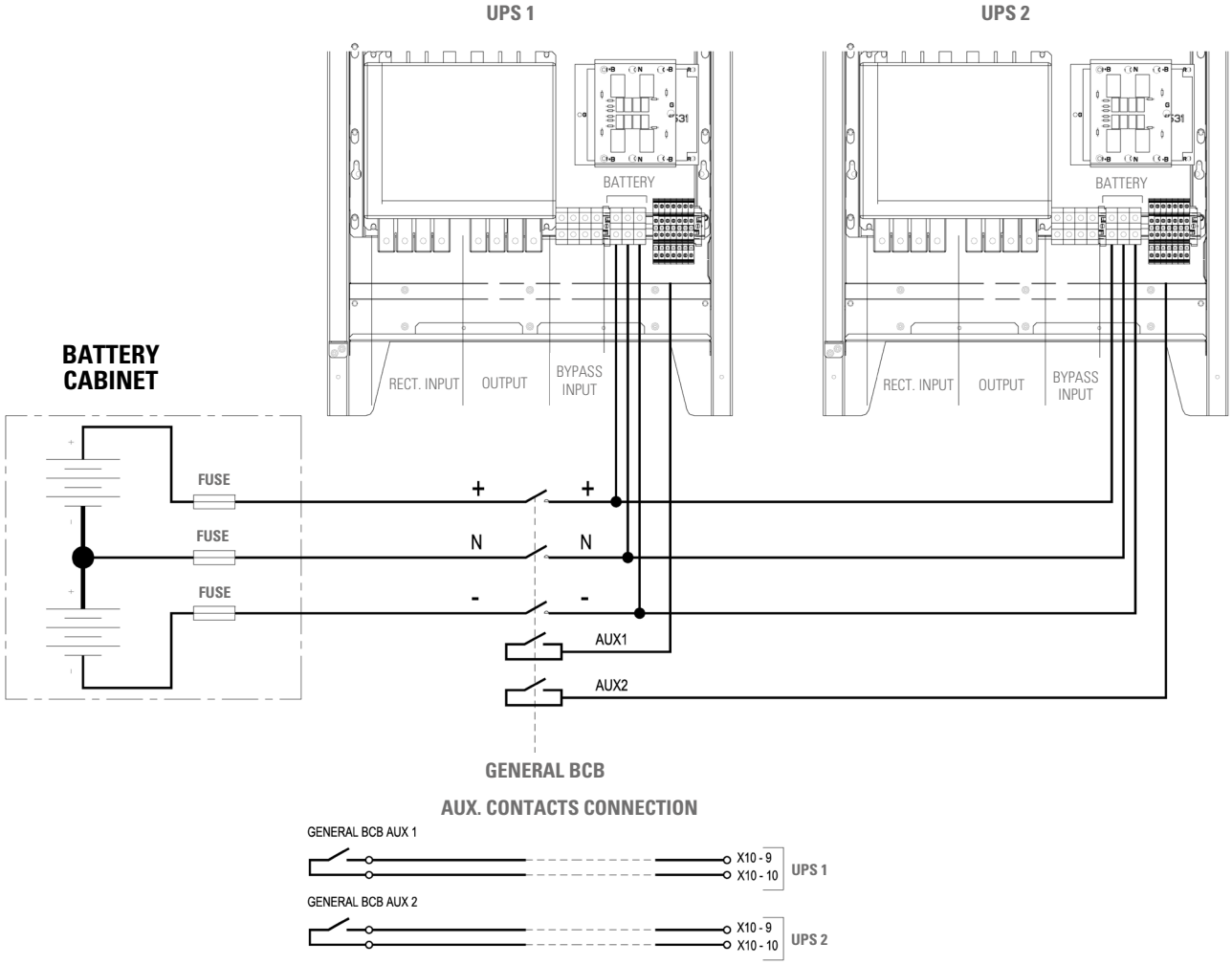



*Fig. 50. Connection of the SLC 80 X-PERT battery.*

We recommend that you connect the UPS battery inputs to the common GENERAL BCB disconnector, using cables of the same length and cross section.
To identify the battery input terminal, consult this manual and the identification labels located near the terminal block.
You need to install fuses in order to protect the wiring that connects the GENERAL BCB disconnector on the battery cabinet to the BCB disconnectors on the UPSs. You must select the size of the fuse based on the power of the UPS and the cross section of the wiring.

The auxiliary contacts of the two UPSs must be mutually insulated.

- Every SLC X-PERT UPS between 100-160 kVA and 200-300 kVA must be connected to the battery via an **external BCB disconnector** (BCB1 and BCB2 in Fig. 51). The battery disconnector must be equipped with a "normally open" contact in order to be connected to the BCB-AUX input disconnector. The connection diagram is shown in the following figure:

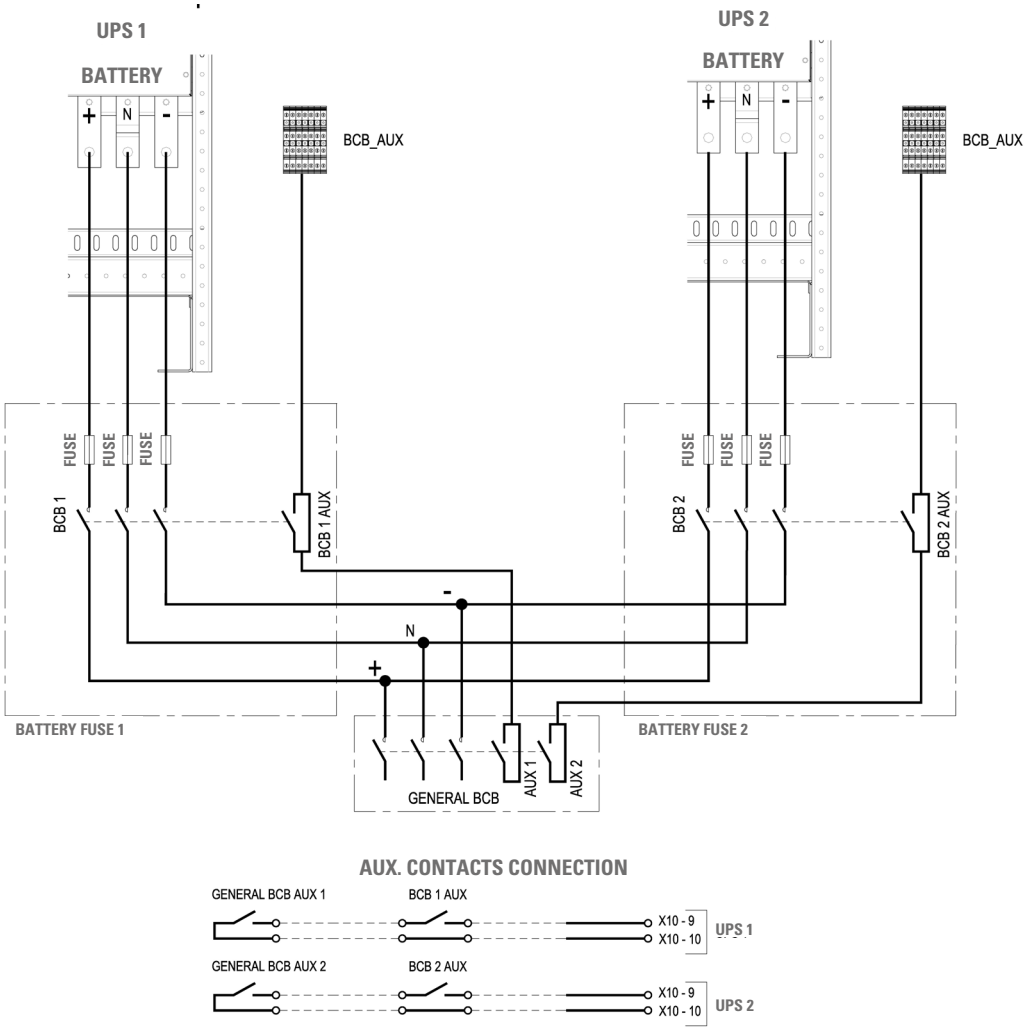



*Fig. 51. Connection of the SLC 100 - 160 X-PERT and SLC 200 - 250 - 300 X-PERT battery.*

We recommend that you first connect the UPS battery inputs to the external BCB disconnectors, and then to the common GENERAL BCB disconnector, using cables of the same length and cross section.
The type and position of the battery input on the terminal block may change, depending on the power of the UPS.
To identify the battery input terminal, consult this manual and the identification labels located near the terminal block.
You need to install fuses in order to protect the wiring that connects the GENERAL BCB disconnector on the battery cabinet to the BCB disconnectors on the UPSs. You must select the size of the fuse based on the power of the UPS and the cross section of the wiring.
The auxiliary contacts of the two UPSs must be mutually insulated.

- The common battery is connected to a protection board, the diagram for which is shown in Fig. 52 below:

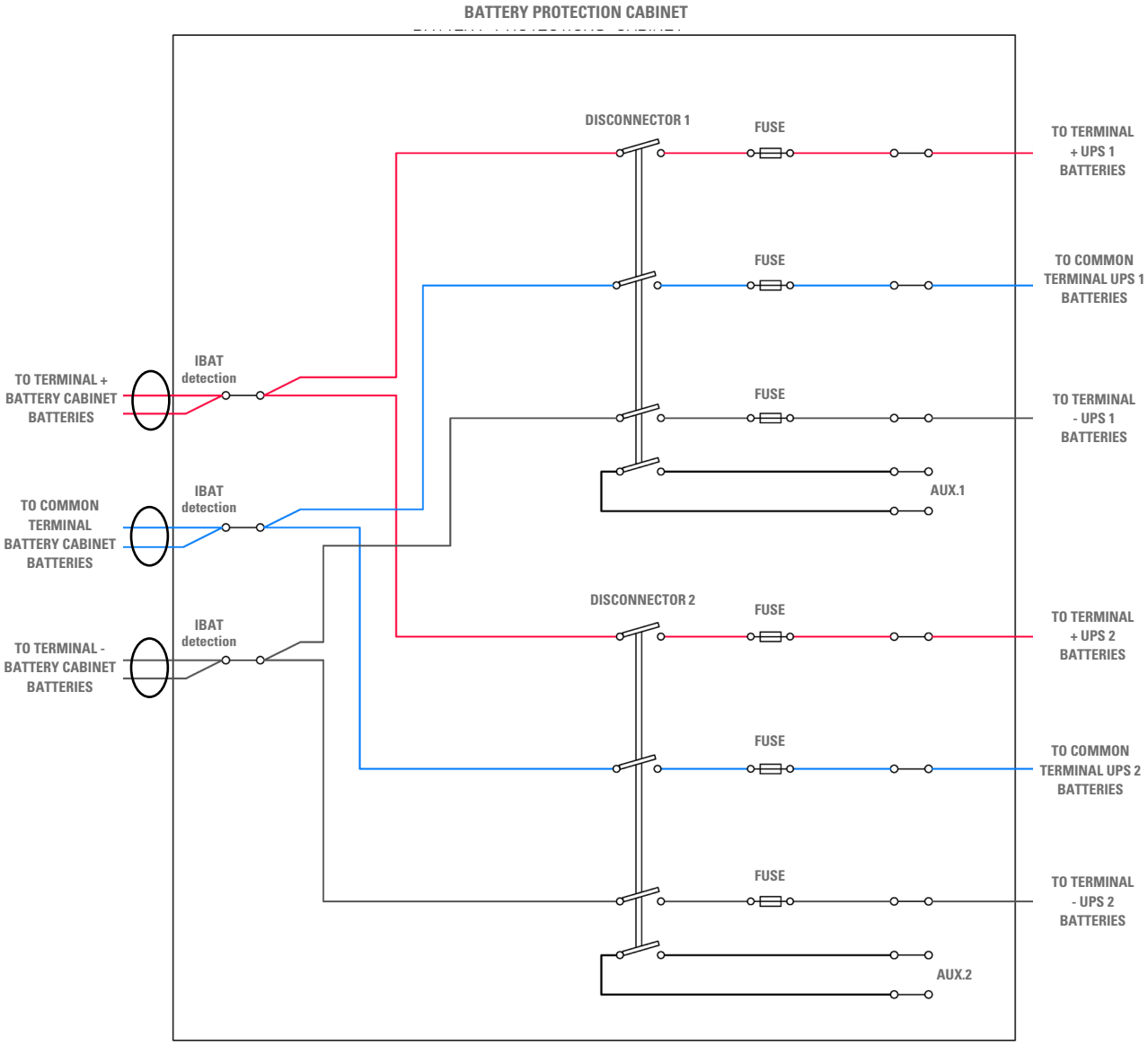



*Fig. 52. Diagram of the protection board for the common battery.*

# 6. OPERATION.

## 6.1. STARTUP.

### 6.1.1. Pre-startup checks.

**Read the technical documentation.**
Before installing and using the device, all instructions contained in this manual and in the technical assistance documentation must be read and understood.

**External disconnectors.**
The following procedures refer to the external BCB disconnector and are valid only if the device is installed (externally) and its auxiliary contacts are correctly wired to the terminals of the UPS.

**Preliminary checks:**

- Make sure that all connections have been made correctly and with sufficient torque, respecting the labelling of the device and the instructions in Chapter 5.
- Check that the UPS and battery module switches are turned off.
- Make sure that all of the loads are 'Off.'

  Shut down the connected loads before starting the UPS and start the loads, one by one, only when the UPS is running. Before shutting down the UPS, check that all of the loads are 'Off.'
- It is very important to proceed in the established order.
- Before starting the unit, verify that:
  - ❒ All installation and electrical connection work has been carried out by qualified technicians.
  - ❒ All of the power and control cables have been connected correctly and firmly to the corresponding terminals.
  - ❒ The earth cable is connected correctly.
  - ❒ The polarity of the batteries is correct and the voltage is within operating values.
  - ❒ The phase rotation (phase sequence) of the line is correct and the voltage is within the tolerance of the operating values.
  - ❒ The emergency power off button (EPO), if installed, is not activated (if it is, reset it to the standby position).

### 6.1.2. Startup procedure.

**EPO button and phase rotation (phase sequence).**

Before starting the UPS, verify that:

- The emergency power off button (EPO), if installed, is not activated. If it is, set it to the standby position (Off).
- The input and output phase rotation is correct.

**BCB switch.**
Do not set the BCB switch (battery switch) to 'On' before it is required by the control panel. This can cause serious damage to device and batteries.

**Wiring of the auxiliary contacts.**
Correctly carry out the electrical installation by wiring the auxiliary contacts of the external manual bypass, battery disconnector and output to the corresponding terminals of the UPS. This will allow the control logic to acquire the state of the switches and guide the operator during startup and maintenance bypass procedures.

**Startup procedure**

1. Set the rectifier's input RCB switch to 'On.' After a few seconds, the touch screen will start and show the diagram of the UPS.

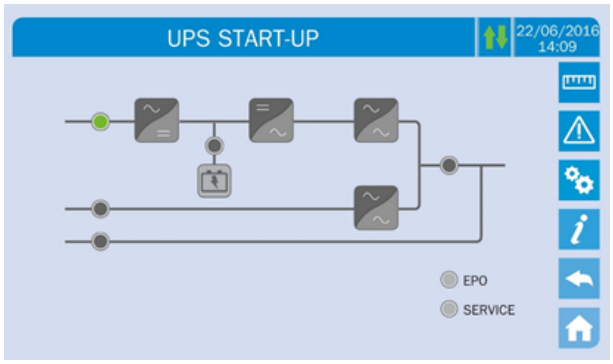



*Fig. 53. Page for the startup of 200... 300 kVA devices.*

2. After the software loading phase, the control logic will acquire the state of the system and the operation of the RCB switch, showing the operating sequences.

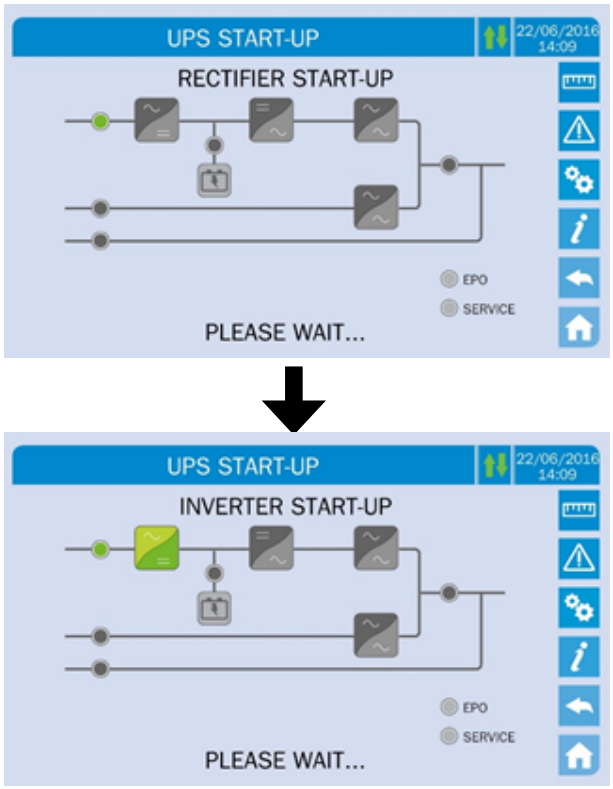



*Fig. 54. Rectifier (above top) and inverter (above bottom) startup.*

3. Once the inverter has started successfully, set the SBCB bypass switch to 'On' when indicated by the screen to do so. The control logic will check the accuracy of the bypass phase sequence and the RMS voltage value.

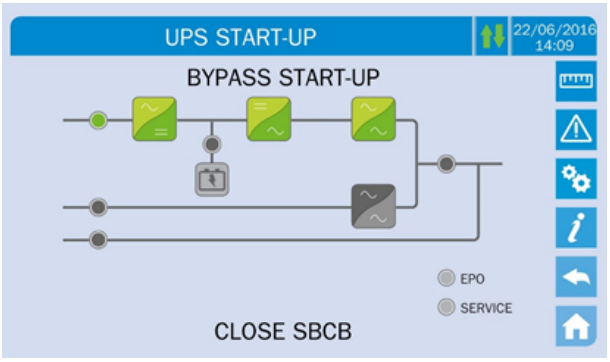



*Fig. 55. Bypass startup.*

4. Set the BCB switch of the batteries to 'On' when indicated by the screen to do so.

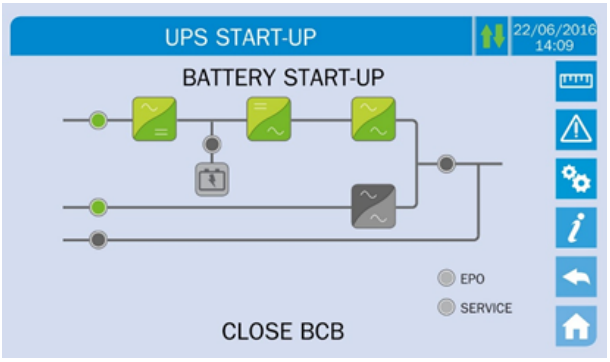



*Fig. 56. Battery startup.*

**BCB switch operation.**
The BCB switch, located in the external cabinet, can only be closed if the DC voltage is within tolerance. Serious damage to both the batteries and device can occur if the switch is closed before indicated by the control panel.

5. Set the UPS's OCB output switch to 'On' to connect the device to the loads bus. After this operation, the startup will be complete and the screen will show the final diagram.

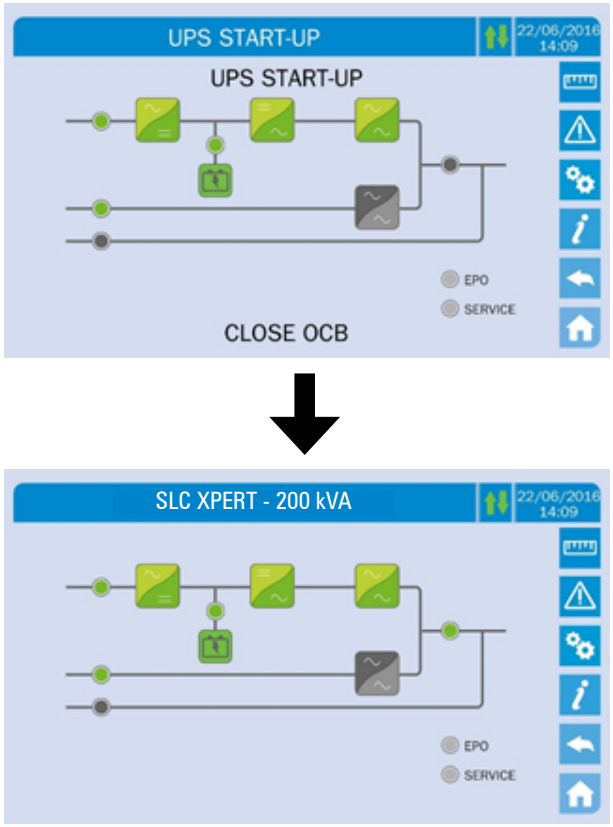



*Fig. 57. Completion of startup.*

## Basic troubleshooting

| PROBLEM | SOLUTION |
|---|---|
| After closing the RCB, the LCD remains switched off | 1) Check the phase rotation of the supply voltage.<br>2) Verify that the input voltage and frequency are within tolerance.<br>3) Check rectifier protection fuses F1-F2-F3 (located inside the UPS) |
| After step 1, the UPS stops the startup sequence and displays one or more alarm messages. | 1) Check the alarms indicated on the screen and eliminate the causes.<br>2) Close the RCB and try to restart the UPS. |
| After step 8, alarm A15 (bypass failure) appears | 1) Verify that the SBCB switch is set to 'On.'<br>2) Check the protection fuses of the static bypass switch (located inside the UPS).<br>3) Check the phase rotation of the bypass voltage.<br>4) Verify that the voltage and frequency are within tolerance. |
| After step 10, alarm A7 (BCB open) appears | 1) Verify that the battery switch has been turned 'On'; the switch and fuse holder are located on the outside of the UPS.<br>2) Check the battery fuses.<br>3) Check the interconnection between the auxiliary contacts of the batteries (in the external cabinet) and terminals X10-9/10. |

*Table 13. Basic troubleshooting*

## 6.2. SHUTDOWN PROCEDURE.

1. Set the OCB switch to 'Off.'
   The power supply to the load is interrupted and LED 7 turns off. Alarm A30 (common alarm) is displayed on the screen.
2. Set the BCB switch to 'Off.'
   The batteries are disconnected from the rectifier and LED 4 blinks red. The screen continues to show alarm A30.
3. Set the SBCB switch to 'Off.'
   The bypass power supply is disconnected and LED 2 turns off. The screen continues to show alarm A30.
4. Set the RCB switch to 'Off.'
   The rectifier and inverter turn off. The screen continues to show alarm A30.
   The shutdown procedure ends. OFF is indicated on the screen.

## 6.3. MANUAL (OR MAINTENANCE) BYPASS.

### 6.3.1. Manual bypass transfer procedure.

The load is transferred to manual bypass without interrupting the power supply of the loads. In this configuration, the system can be restarted by means of the return from load procedure in the manual bypass, avoiding leaving the loads without voltage.

**Manual bypass**
To perform the switching procedure correctly, verify that there are no alarms present in the system.
While the device is in manual bypass, the load is powered directly by the input mains, so continuous powering of the loads cannot be guaranteed.

1. Move the SW bypass selector to the BYPASS position.
   The load is transferred to the bypass line, LED 5 turns off and LED 6 is shown in orange. The screen indicates alarm A30 (common alarm).
2. Set the MBCB switch to 'On.'
   The inverter shuts down and the load is powered by the input mains via the manual bypass switch. The static bypass switch is closed and LED 8 is shown in orange. The screen continues to show alarm A30.
3. Set the BCB switch to 'Off.'
   The batteries are disconnected from the DC bus. LED 4 blinks red. The screen continues to show alarm A30.
4. Set the RCB switch to 'Off.'
   The input power is open; the rectifier turns off. LED 1 turns off and the screen continues to show alarm A30.
5. Set the OCB switch to 'Off.'
   The line is still powered by the manual bypass switch and LED 8 turns off. The screen continues to show alarm A30.
6. Set the SBCB switch to 'Off.'
   The bypass line is disconnected and the screen turns off. The screen continues to show alarm A30.
   The load is powered directly by the mains through the manual bypass switch. The UPS is isolated. The screen shows the message: OFF.

### 6.3.2. Restarting the UPS from the manual bypass.

Before restarting the UPS from the manual bypass, verify that the SW switch is in the BYPASS position and the MBCB switch is closed.

1. Set the rectifier's input RCB switch to 'On.' After a few seconds, the touch screen will start and show the diagram of the UPS.

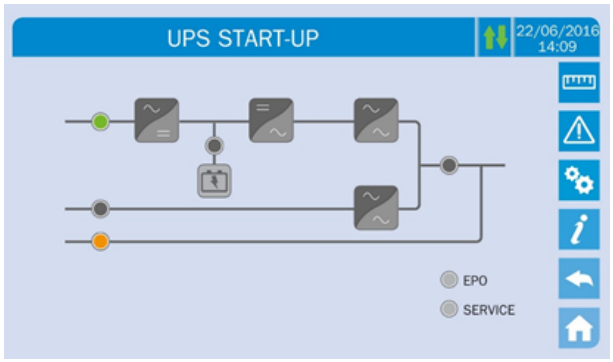



*Fig. 58. Startup from the manual bypass*

2. After the software loading phase, the control logic will acquire the state of the system and the operation of the RCB switch, and will show the operating sequences. Set the SBCB switch to 'On' when requested.

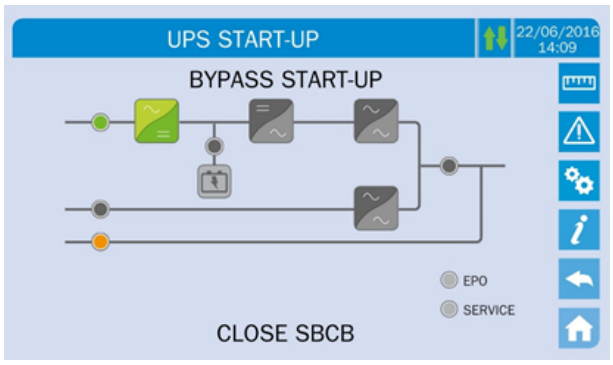



*Fig. 59. Bypass startup.*

3. Set the BCB switch of the batteries to 'On' when indicated by the screen to do so.

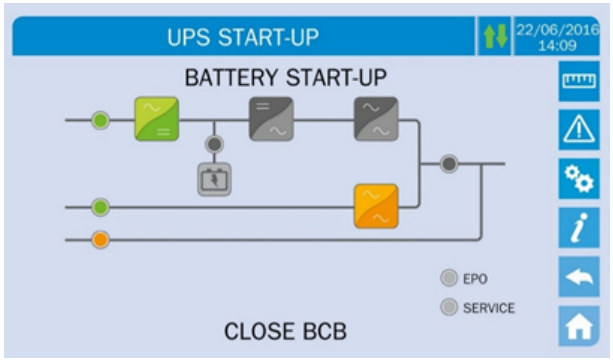



*Fig. 60. Battery connection.*

4. Set the OCB output switch to 'On' when required and, immediately afterwards, the screen will require the MBCB switch of the manual bypass to be set to 'Off.' The inverter will start.

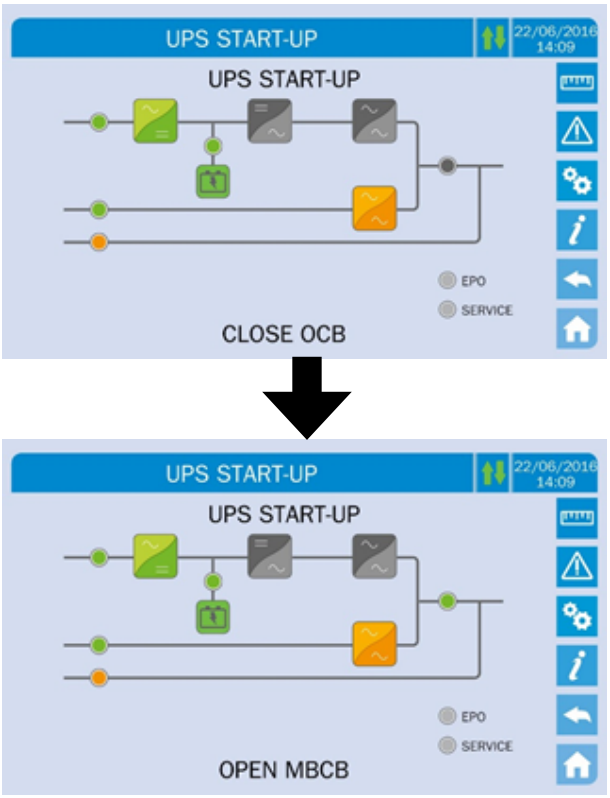
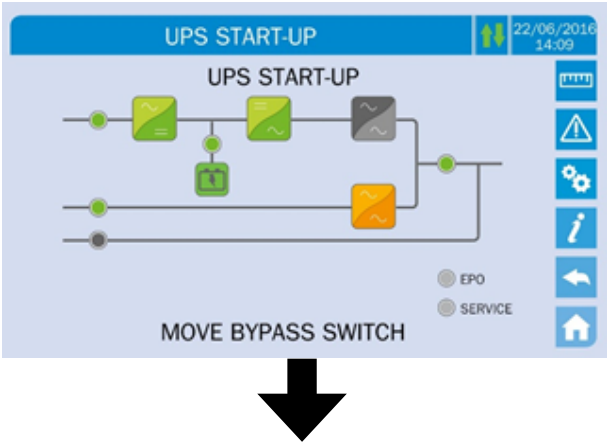



*Fig. 61. Set the OCB switch (above top) to 'On' and set the MBCB switch (above bottom) to 'Off.'*

5. As soon as the inverter starts, it will be possible to transfer the load. Move the bypass switch to NORMAL when required to do so by the screen to complete the startup of the UPS.



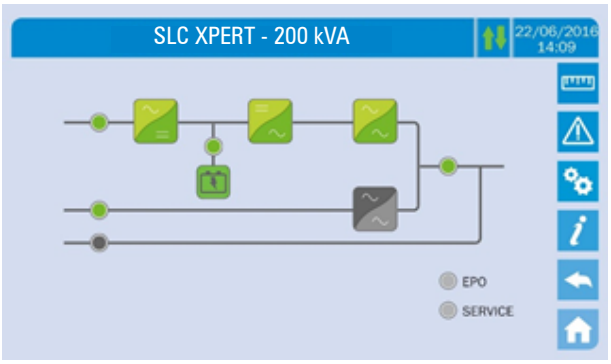




*Fig. 62. Load transfer (above top) and end of restart from manual bypass (above bottom).*

## 6.4. REDUNDANT PARALLEL SYSTEM.

- The redundant parallel system consists of n UPSs (up to a maximum of 6 units) configured as redundant parallel units.
- The manual bypass switch is internal to each UPS of the system, which guarantees continuity of supply even if more than one failure is detected. This is possible because all of the units operate and constantly power the loads in parallel, each of them providing a current equal to the total load/n. The automatic balancing of the AC current distributes the n currents evenly and reduces the unbalance to less than 10%.
- The load is powered by the inverters in parallel even if an instantaneous overload of less than 200% of the rated load occurs.
- In the event of a fault in one of the units, the load will be powered by the rest. Only if failures are detected in other units will the load be transferred to the emergency power supply (bypass).
- A parallel system with several connected UPS units has the form shown below, where the current main or Master UPS unit and those that have been added or Slaves (UPS n) are shown.

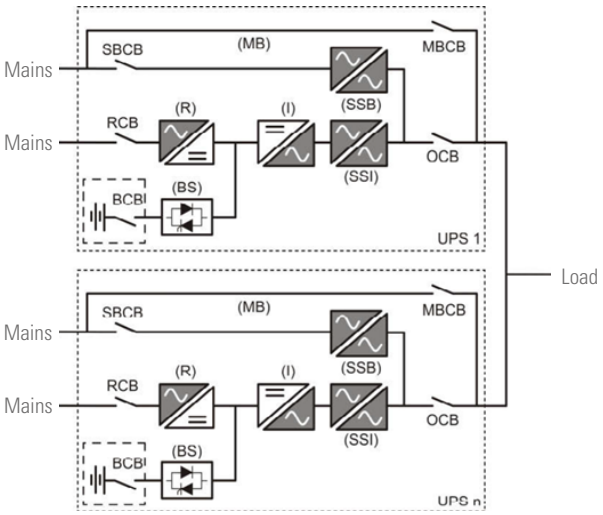



*Fig. 63. Block diagram of a parallel system.*

### 6.4.1. Verification of the parallel system.

After the installation of the hardware and configuration of the units involved, it is necessary to verify the function of all of them. To do so, the units need to be started in manual bypass mode. The procedure is indicated below:

- Set the MBCB switch of each unit involved to 'On.'
- Move the Normal/Bypass selector to the BYPASS position.
- Set the RCB switch of each unit to 'On.'
- Follow the instructions shown on the front panel of each unit until you see the following message: 'STARTING FROM MANUAL BYPASS-OPEN ALL MBCB SWITCHES.'
- On the second row of the screen, the real configuration of the parallel system will be shown.
  The screen shows the numbers of the UPSs involved, indicating with an M the MASTER device (normally the unit with the lowest number), with an S the SLAVE device with square brackets '**[ ]**' the number of the UPS in particular, and with a question mark '?' that the unit is not communicating with the rest. If there are no more units in the parallel system, it would be indicated with a hyphen '-.'
  When the screen shows OPEN MBCB SWITCH instead of OPEN ALL MBCB SWITCHES, it means that this particular unit is configured in single mode and not parallel mode. The UPS must be configured in parallel mode before continuing.
  It is not possible for two or more units to become MASTER of the system. Make sure that two or more units do not have square brackets in the same number, since this would indicate that the UPS is incorrectly configured within the system.
- Once the configuration of the units involved has been verified, continue with startup after the OPEN ALL MBCB SWITCHES message has appeared.
- After this step, move the bypass selector of all units to the NORMAL position. The system will take charge of the load if n-1 units are in this position.
- Move the last bypass selector to the NORMAL position.
- The system will power the load in parallel once the STARTUP END message appears.

### 6.4.2. Operating states of the redundant parallel system.

- N units in normal operating mode:
  Load powered by the inverter and possibility of a continuous fault.
- N-1 units in normal operating mode:
  Load powered by the inverter and, in case of fault, transfer to the bypass line.
- Mains failure:
  The load is powered by the batteries through the inverter.
- Availability of n bypass lines:
  Load powered by the bypass in case of at least two inverter faults or overload.
- Availability of n-1 bypass lines:
  Load powered by the bypass in case of at least two inverter faults or overload.

### 6.4.3. System behaviour.

The static and dynamic behaviour of the parallel system improves with each individual unit since, thanks to the redundancy, the total available power is higher than the rated power of the system.

**Overload**.
The overload limit depends on the number of units connected to the load: Imax=n·In. If the load exceeds this limit, a visual and audible alarm is activated on the front panel of the UPS. This alarm activates the thermal image algorithm, and after a certain time, the load is transferred to the bypass (if available).
**Short-circuit**.
If a short-circuit in the output is confirmed, the system automatically transfers the load to the bypass. If not, all of the units will provide a current between 250% and 300% of the rated current for 70 ms. If the short-circuit condition has not been removed, the current provided will be 150% of the rated current for 5 seconds.

### 6.4.4. Redundant parallel system startup.

#### 6.4.4.1. Direct startup (in the case of 2 UPSs).

When the system consists of 2 units, it is possible to start the system directly. To continue with the startup of a UPS, set the RCB switch to 'On' and follow the procedures indicated on the screen. Then the other UPS can be started normally by setting the RCB switch to 'On' and following the procedure indicated on the screen.

#### 6.4.4.2. Startup in manual bypass (in the case of 2 UPSs).

In the case of two units, it is also possible to start the parallel system from the manual bypass. If the UPS is in manual bypass, check the two initial points of the procedure described below:

- ❒ Set the MBCB switch on the manual bypass of both units to 'On.'
- ❒ Move the bypass selectors.
- ❒ Set the RCB switch of both units to 'On.'
- ❒ Follow the instructions on the front panel for each UPS until the SET BYPS SWITCH message appears.
- ❒ Move the bypass selector to NORMAL: the UPS powers the load.
- ❒ Move the bypass switch: the STARTUP END message appears.

**Attention.**
When the OPEN ALL MBCB SWITCHES request appears, it is necessary to set the MBCB switches on all of the UPSs and/or those located in the external cabinets to 'Off.'

6.4.4.3. Startup with manual bypass (in the case of n UPSs).

When there are more than two units, it is only possible to start the parallel system from the manual bypass. Its purpose is to connect all of the units in the load line at the same time. If the units are already in manual bypass mode, it acts on the first two points of the procedure described below:

- ❒ Set the MBCB switch on the manual bypass of all of the units to 'On.'
- ❒ Move all of the bypass selectors to the BYPASS position.
- ❒ Set the RCB switch on all of the units to 'On.'
- ❒ Follow the instructions on the front panel for each unit until the SET BYPS SWITCH message appears.
- ❒ Move the bypass selector on the UPS. The parallel system powers the load when n-1 bypass switches change to NORMAL mode.
- ❒ Move the bypass selector on the remaining units.
- ❒ The UPSs power the load in parallel and the STARTUP END message appears.

**Attention.**
When the OPEN ALL MBCB SWITCHES request appears, it is necessary to set the MBCB switches on all of the UPSs and/or those located in the external cabinets to 'Off.'

6.4.4.4. Transfer to manual bypass procedure.

- Move all of the bypass selectors to the BYPASS option to transfer the system to bypass. Set one or more of the MBCB switches to 'On' to stop all of the inverters with the respective alarm.
- In each unit of the parallel system, it is necessary to set the OCB, SBCB, BCB and RCB switches to 'Off,' following the order indicated.

6.4.4.5. Return from manual bypass procedure.

The system is in manual bypass mode with one or more MBCB switches closed and all of the bypass selectors in the BYPASS position. To restart the system ensuring continuity in the loads, it is necessary to follow the following procedure (in the case of 2 or n units):

- ❒ Set the RCB switch on all of the units to 'On.'
- ❒ Follow the instructions on the front panel for each UPS until the CLOSE BYPASS SWITCH message appears.
- ❒ Move the bypass selector of the UPS. The parallel system will power the load when n-1 bypass selectors are in the NORMAL position.
- ❒ Move the bypass selectors; the UPS powers the load and the STARTUP END message appears.

**Attention.**
When the OPEN ALL MBCB SWITCHES request appears, it is necessary to set the MBCB switches on all of the UPSs and/or those located in the external cabinets to 'Off.'

## 6.5. POWER PARALLEL SYSTEM.

The power parallel system consists of *n* UPSs up to a maximum of 6 units, configured as parallel units in addition to power. If a failure occurs in one of the units, the load is transferred to the emergency power supply (Bypass), as in the case of a single UPS (Single).

### 6.5.1. Power parallel system startup.

6.5.1.1. Start up from manual bypass.

The procedure is the following:

- ❒ Set the manual bypass switches on all of the UPSs to 'On.'
- ❒ Move the bypass selectors of all of the units to the BYPASS position.
- ❒ Set the RCB switches on all of the units to 'On.'
- ❒ Follow the instructions on the screen of the UPS with the lowest number (number 1), until the OPEN ALL MBCB SWITCHES message appears.
  Do not set the MBCB switches to 'Off' at this point.
- ❒ Proceed as indicated in the previous points with all of the units up to the highest number (number *n*).
- ❒ Verify that all of the static bypass switches are closed.
- ❒ Set the MBCB manual bypass switches on all of the units to 'Off.'
- ❒ Following the instructions on the screen, move the bypass selectors of all of the units to the NORMAL position, starting with UPS number 1.

6.5.1.2. Transfer to manual bypass procedure.

In the power parallel system, where all inverters are needed to power the load, when an inverter is overridden by the bypass selector, the load is transferred to the emergency line (bypass line).

- ❒ Move all of the bypass selectors to the BYPASS position, so that the load is transferred to the emergency line on all of the units.
- ❒ Set one or more MBCB switches to 'On' (all of the inverters will stop with alarm A13).
- ❒ Starting with the UPS with the highest number (number n), set the OCB, SBCB, BCB and RCB switches to 'Off.'

6.5.1.3. Restart from manual bypass.

The system is in manual bypass condition with one or more MBCB switches closed and all of the bypass selectors in the BYPASS position. The system can be restarted according to the following procedure:
Set the RCB switch on all of the units to 'On.'

- ❒ Follow the instructions on the screen of the UPS with the lowest number (number 1), until the OPEN ALL MBCB SWITCHES message appears.

Do not set the MBCB switches to 'Off' at this point.

❒ Proceed as indicated in the previous points for all of the units up to the highest number.

❒ Verify that all of the static bypass switches are set to 'On.'

❒ Set the MBCB manual bypass switches on all of the units to 'Off.'

❒ Following the instructions shown on the screen, move the bypass selectors of all of the units to the NORMAL position, starting with UPS number 1.

**Attention.**

When the OPEN ALL MBCB SWITCHES request appears, the operator must set all of the MBCB switches and/or those installed in outdoor cabinets to 'Off.'

## 6.6. PARALLEL SYSTEM IN COMMON BATTERY CONFIGURATION (OPTIONAL).

The common battery function lets you use a single bank of batteries in a system comprised of two UPS units connected in parallel, in both redundant and power mode. In parallel redundant mode, the use of a single battery shared by the two UPSs ensures a full period of backup, even if one of the units fails.

The common battery function can only be used in systems consisting of two UPSs connected in parallel, whether in redundant or power mode.

Available up to 300 kVA

### 6.6.1. Constituent parts of a system in common battery configuration.

Fig. 64 shows a system in common battery configuration. The constituent parts of a standard UPS are:

- Rectifier to IGBT (R)
- Inverter (I)
- Battery (B)
- Static battery switch (BS)
- BCB battery disconnector (internal or external)

Read section "6. OPERATION." to gain a greater understanding of each of these parts.

The battery cabinet (BCB-CAB) must be connected to the input of the two BCB disconnectors on the UPS units. If they are not supplied with the UPS units, the BCB disconnectors must be installed externally, equipped with a "normally open" auxiliary contact and connected to the BCB-AUX input on the UPS input.

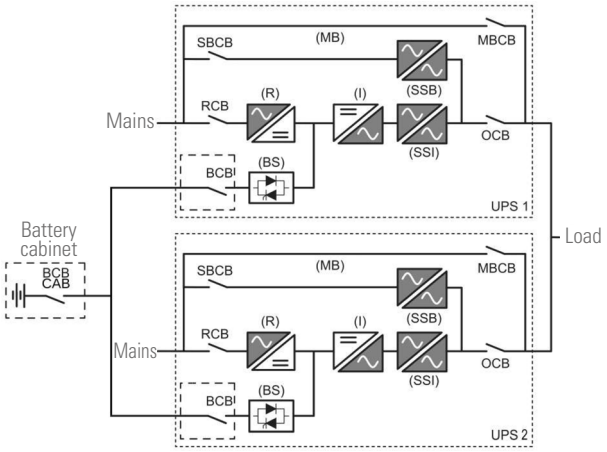



*Fig. 64. Block diagram of a system in common battery configuration.*

You must take particular care to observe the correct polarity of the battery.

The manufacturer shall not bear any liability for any damage to people or property resulting from the failure to heed this warning.

### 6.6.2. System Operation.

6.6.2.1. Description.

The common battery function lets you use a single bank of batteries in a system comprised of two UPS units connected in parallel, using a dedicated CAN-BUS communication. The following sections illustrate the operational differences with regard to the same configuration in parallel with separate batteries.

6.6.2.2. Parallel redundant

**Rectifier failure**

For a system in the parallel redundant configuration, in the event of rectifier failure, the inverter of the UPS affected will shut down after 15 seconds. The system will then consist of a single UPS to power the loads and recharge the batteries.

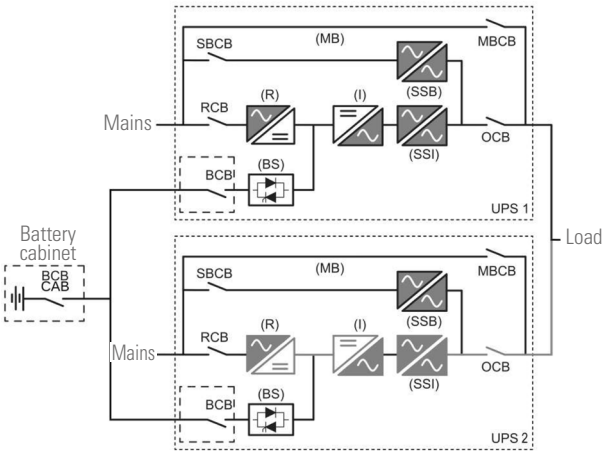



*Fig. 65. Rectifier failure and subsequent inverter shutdown.*

**Inverter fault**

For a system in the parallel redundant configuration, in the event that one of the inverters fails, the load will be powered by the remaining inverter. The battery will be recharged by both rectifiers.

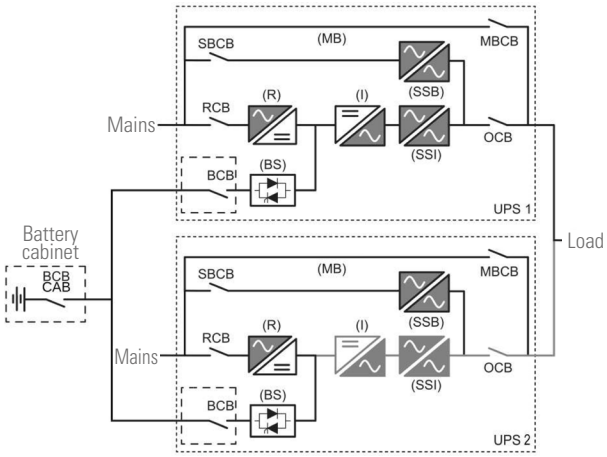



*Fig. 66. **Inverter fault***

6.6.2.3. Parallel power

**Rectifier fault**

For a system in the parallel power configuration, in the event that one of the rectifiers fails, the inverter affected will shut down after 15 seconds. This will force the load onto the by-pass (both bypass lines). The battery will be recharged by the remaining operational rectifier.

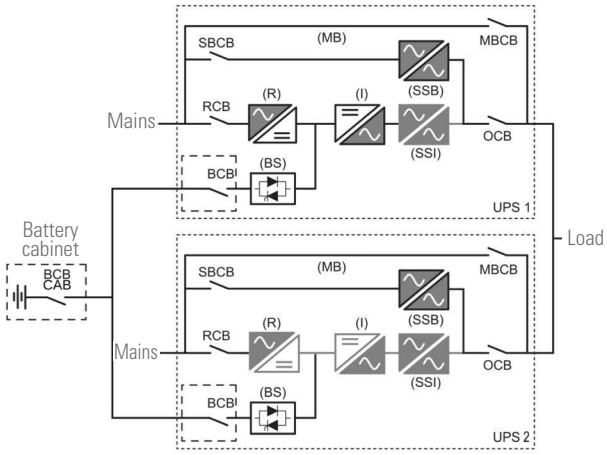



*Fig. 67. **Rectifier fault.***

**Inverter fault**

For a system in the parallel power configuration, in the event that one of the inverters fails, the load will be powered through the bypass. The battery will be recharged by both rectifiers.

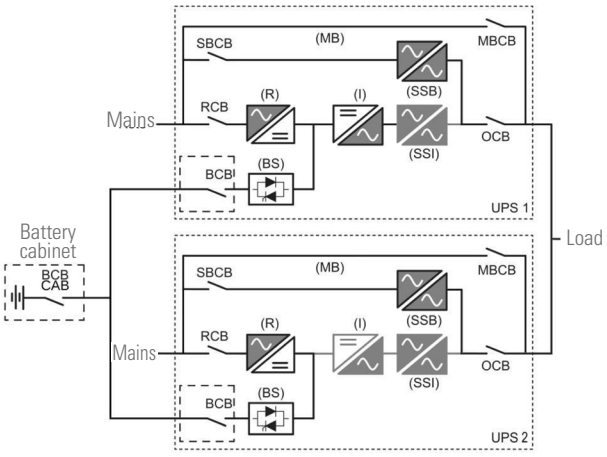



*Fig. 68. **Inverter fault***

### 6.6.3. System behaviour.

In this system, the same behaviour applies to the distributed battery, except for the aspects related to battery recharging (see sections 6.4 and 6.5).

6.6.3.1. Battery recharging.

Recharging is carried out by both UPSs, each of which supplies the maximum current (adjusted in the EEPROM).

$$IBAT = IBAT_{UPS1} + IBAT_{UPS2}$$

### 6.6.4. System Operations.

6.6.4.1. Start-up

The "Direct start-up" and "Start-up from MBCB" functions can be activated by following the steps described in sections 6.4 and 6.5.

6.6.4.2. Load transfer to manual bypass.

The transfer to manual bypass function can be activated by following the steps described in sections 6.4 and 6.5.

⚠ During operation in manual bypass mode, the load is powered directly by the mains, so continuous powering cannot be guaranteed.

# 7. CONTROL PANEL.

Devices from the X-PERT 200... 400 kVA series feature a 10.1 inch touch screen that dialogues with the I/O (input/output) module of the control logic via a serial protocol. The Home screen shows a flow diagram of the system, from which all of the operating variables of the UPS can be accessed.
In addition, LEDs can be found on the frame of the control panel (see Fig. 53), with the meanings described in Table 13.

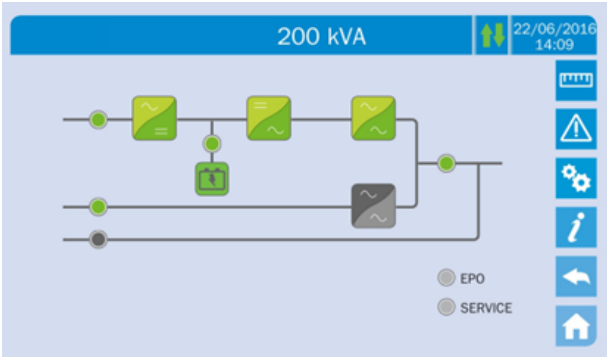



*Fig. 69. Front panel of the UPS. Home screen.*

Navigating the pages of the touch screen is possible through the 6 icons on the right. The up/down arrows control the communication of the screen.

| ICON | ASSIGNED FUNCTIONS |
|---|---|
| Measurements | Enter the Measurements section |
| Alarms | Enter the Alarms section and reset the audible alarm if activated |
| Settings | Enter the Settings section |
| Info | Enter the Information section |
| Back | Go back one page |
| Home | Go back to Home |
| Communication | Control communication between the panel and the electronics of the UPS |

*Table 14. Functions of the icons on the screen of the front panel.*

The icons can change colour depending on the operating condition of the UPS. In general, the basic colours are:

- ❒ Light blue: indicates that the section is related to the UPS.
- ❒ Grey: the keys turn grey (disabled) when you enter the specific section of the key.
- ❒ Red: the Alarms key appears in red in case of an alarm.

Regarding the Communication icon, it appears in red in case of a communication error between the touch screen and the control logic of the UPS.

## 7.1. LEDS ON THE FRAME OF THE CONTROL PANEL.


*Fig. 70. LED bar on the frame of the control panel.*

| LED | STATUS | MEANING |
|---|---|---|
| LED 11 | GREEN | AC line at the input of the rectifier within tolerance |
| | GREEN | Incorrect phase rotation (rapid blinking) |
| | GREEN | Unbalanced AC voltage (slow blinking) |
| | OFF | AC mains failure |
| LED 12 | GREEN | BCB switch closed and batteries charging |
| | ORANGE | Batteries discharging or performing test (rapid blinking) |
| | ORANGE | BCB switch open (slow blinking) |
| | RED | End of backup/Battery failure |
| LED 13 | GREEN | Inverter voltage within tolerance and static switch closed |
| | ORANGE | Inverter overload or short-circuit |
| | RED | Inverter critical alarm |
| | OFF | Inverter off |
| LED 14 | GREEN | AC bypass line within tolerance |
| | RED | Incorrect phase rotation (rapid blinking) |
| | RED | AC bypass line out of tolerance/Failure |
| LED 15 | ORANGE | Scheduled maintenance required (slow blinking) |
| | ORANGE | Critical alarm (rapid blinking) |

*Table 15. Meaning of LEDs on control panel frame.*

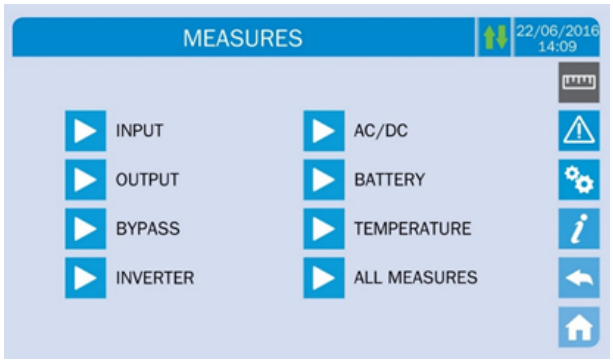



*Fig. 71. Measures section.*

To enter the measures page of a specific section of the UPS, it is necessary to press one of the arrows. Below is a page of typical measures.

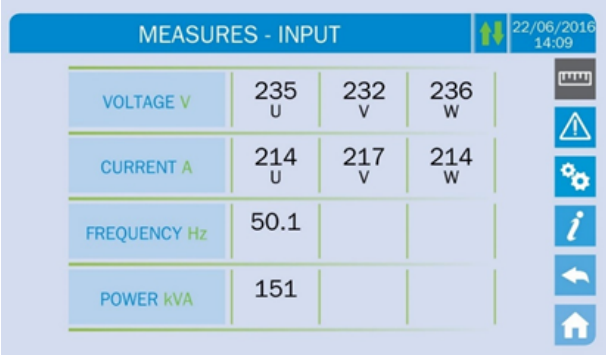



*Fig. 72. Input measures page.*

List of all of the measures available.

| Submenu/Subpage | Displayed data | Accuracy |
|---|---|---|
| INPUT | Rectifier input voltage [1] | 1 V |
| | Rectifier input current | 1 A |
| | Frequency | 0.1 Hz |
| | Input power | 1 kVA |
| OUTPUT | Voltage [1] | 1 V |
| | Current | 1 A |
| | Load percentage | 1 % |
| | Active power | 1 kW |
| | Apparent power | 1 kVA |
| | Frequency | 0.1 Hz |
| BYPASS | Voltage [1] | 1 V |
| | Frequency | 0.1 Hz |
| INVERTER | Voltage [1] | 1 V |
| | Frequency | 0.1 Hz |
| AC / DC | Rectifier output voltage | 1 V |
| BATTERY | Voltage and current | 1 V / 1 A |
| | Rated capacity | 1 Ah |
| | Residual backup | 1 min / 1% |
| TEMPERATURE [2] | Batteries | 0.1 °C |
| | UPS | 0.1 °C |

*Table 16. Data that can be viewed in the Measures section/menu.*

[1] Voltage measurements always refer to the phase-neutral value.
[2] Temperatures are displayed only if the probe is installed.

## 7.2. BASIC DIAGNOSTICS.

By pressing the alarm icon on the control panel, the current operating status of the device is shown and the event log is accessed

The UPS STATUS submenu displays the alarms present and the operating conditions. The HISTORY menu shows the event log.

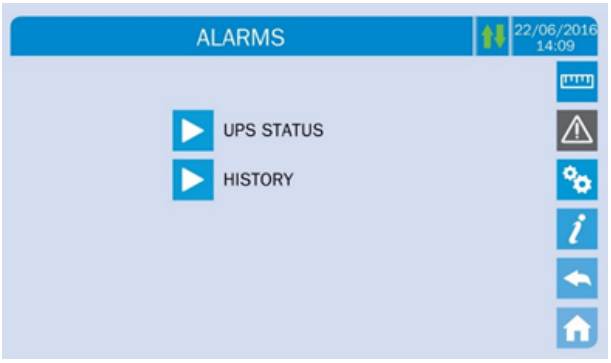



*Fig. 73. SLC X-PERT UPS Alarms section.*

### 7.2.1. Display of operating states.

By pressing UPS STATUS, the operating status of the UPS and possible active alarms will be shown.

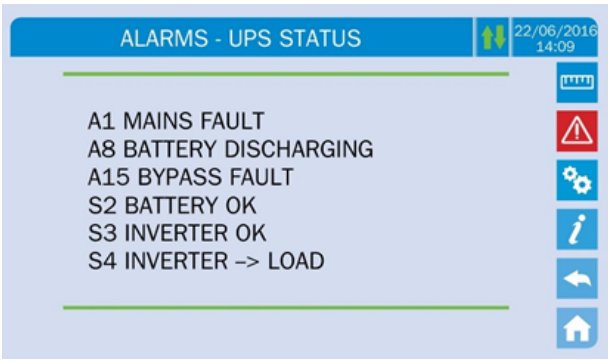



*Fig. 74. UPS STATUS subpage of the Alarms section of the device.*

If the list exceeds the capacity of a page (8 lines), it can be moved by sliding a finger across the screen.

### 7.2.2. Icon colours.

The Alarm and Home page icons can change colour depending on the condition of the UPS and the screen being displayed.

| Icon | Colour | Meaning |
|---|---|---|
| | Light blue<br>Dark blue | No alarms activated. |
| | Grey | No alarms activated.<br>A page of the Alarms section is displayed. |
| | Red | Alarm activated. If the alarm affects one of the modules, the corresponding icon on the Home page will change colour to orange or red. |
| | Light blue | No alarms activated. |
| | Red | Alarms activated in the I/O module while a page of one of the sections of the power modules is displayed. |

The audible alarm, if enabled, will be activated to indicate that a failure has occurred. The audible alarm can be muted by pressing the alarm icon.

### 7.2.3. Display of the alarms history.

In the Alarms section, you can access the page corresponding to the alarm history. The following image shows the content that can be displayed.

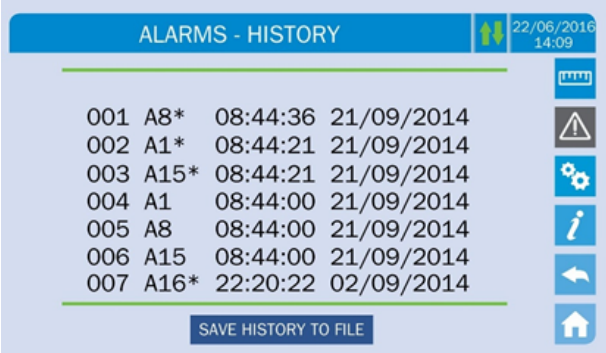



*Fig. 75. Device alarms history page.*

- The first event shown is the most recent (LiFo). For each new event, all of the previous events automatically move one position, deleting the oldest one.
- Each line shows the event number (position in the list), the alarm code and date and time. An asterisk indicates automatic resetting of the alarm.
- Up to a maximum of 250 events can be displayed. The event log can be moved by sliding a finger across the screen.
- By pressing the SAVE HISTORY TO FILE key, a page will be opened to enable selection of one of the three different ways to save the history: SD card, USB, internal memory. The touch screen recognises when an external memory medium is inserted, and the corresponding icon changes from grey to blue (enabled). The text file saved contains the same information as the history, as well as a description of each event.

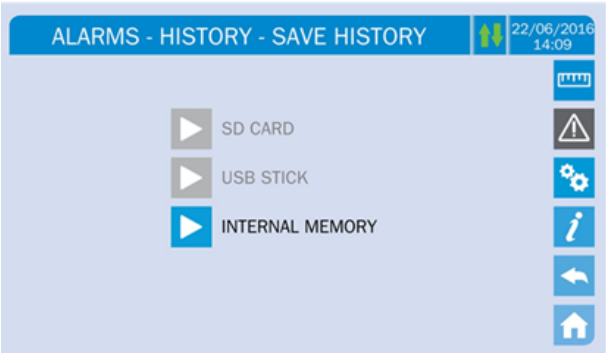



*Fig. 76. Save the history to a file.*

### 7.2.4. Alarms and operating states.

For the SLC X-PERT UPS, any of the following alarms can occur.

| Code | Description |
|---|---|
| **A1** | MAINS FAILURE |
| **A2** | IN. PHASE ROT. ERR |
| **A3** | BOOSTER STOPPED |
| **A4** | BOOSTER FAILURE |
| **A5** | DC VOLTAGE FAILURE |
| **A6** | BATTERY TEST |
| **A7** | BCB OPEN |
| **A8** | BATTERY DISCHARGED |
| **A9** | END BATT. BACKUP |
| **A10** | BATTERY FAILURE |
| **A11** | SHORT CIRCUIT |
| **A12** | SHUTDOWN DUE TO SHORT-CIRCUIT |
| **A13** | INV. OUT OF TOL. |
| **A14** | BYP. PHASE ROT. ERROR |
| **A15** | BYPASS FAILURE |
| **A16** | BYP -> LOAD TRANSFER |
| **A17** | RETRANSFER DISABLED |
| **A18** | MBCB CLOSED |
| **A19** | OCB OPEN |
| **A20** | OVERLOAD |
| **A21** | THERMAL IMAGE |
| **A22** | BYPASS SWITCH |
| **A23** | EPO PRESSED |
| **A24** | HIGH TEMPERATURE |
| **A25** | INVERTER OFF |
| **A26** | COMMUNICATION ERROR |
| **A27** | EMPROM ERROR |
| **A28** | CRITICAL FAILURE |
| **A29** | MAINT. REQUIRED |
| **A30** | COMMON ALARM |
| **A31** | MBCB BUS CLOSED |
| **A32** | EPO BUS CLOSED |
| **A33** | ASYMMETRIC LOAD |
| **A34** | SERVICE REQUIRED |
| **A35** | DIESEL MODE |
| **A36** | RAPID DC SHUTDOWN |
| **A37** | OCBD OPEN |
| **A38** | INVERTER --> LOAD |
| **A39** | INVERT. LOOP ERR. |
| **A40** | SSI FAILURE |
| **A41** | RECT. LOOP VOLT. ERR. |
| **A42** | LOSS OF RECTIFIER REDUNDANCY |
| **A43** | RECTIFIER THERMAL IMAGE |
| **A44** | Inverter DESAT |
| **A45** | HIGH TEMPERATURE IN SSW |
| **A46** | REDUNDANCY LOST |
| **A47** | PARAMETER SEND ERR. |
| **A48** | ERR. PARAMETER RECEP. E2P |

| Code | Description |
|---|---|
| A49 | TEST MODE ERROR |
| A50 | INPUT OVERLOAD |
| A51 | BATTERY TEMPERATURE |
| A52 | INVERTER DISABLED |
| A53 | FIRMWARE ERROR |
| A54 | CAN ERROR |
| A55 | PARALL. CAB. DISCONN. |
| A56 | IN. MAINS UNBAL. |
| A57 | IN. CURR. UNBAL. |
| A58 | INV. CURR. UNBAL. |
| A59 | BACKFEED RL ON |
| A60 | RECTIFIER DESATURATION |
| A61 | MAX VDC |
| A62 | MAINS OVERVOLTAGE |
| A63 | STARTUP SEQ. FAILURE |
| A64 | MAINS UV TRANSIENT |

*Table 17. Alarm code and description.*

The different operating modes or states of the UPS are presented below.

| Code | Description of state |
|---|---|
| S1 | BOOSTER OK |
| S2 | BATTERY OK |
| S3 | INVERTER OK |
| S4 | INVERTER --> LOAD |
| S5 | INV. BYP. SYNCHRONISED |
| S6 | BYPASS OK |
| S7 | BYPASS --> LOAD |
| S8 | MAST. INV. SYNCHRONISED |
| S10 | RECTIFIER IN STANDBY |
| S11 | INVERTER IN STANDBY |
| S12 | BATTERY IN STANDBY |
| S13 | UHE CONDITION KO |
| S14 | BATT. CHARGING I |
| S15 | BATT. CHARGING U |
| S23 | RTC ERROR |

*Table 18. Operating state codes and description.*

**Alarm display and recording mode**

- The states are always displayed in ascending order when the ALARMS - STATUS menu is accessed.
- Alarms are displayed when they are present and must be muted by cancelling the audible alarm.
- Alarms remain visible while they are present, and are automatically stored in the event log.

**Description of alarms and states.**

For a more detailed description of alarms and states, see section 7.5 of this manual.

## 7.3. CONTROL PANEL SETTINGS.

By pressing the Settings icon, the access page to the settings section, which is password protected, will be displayed, as shown in the following image.

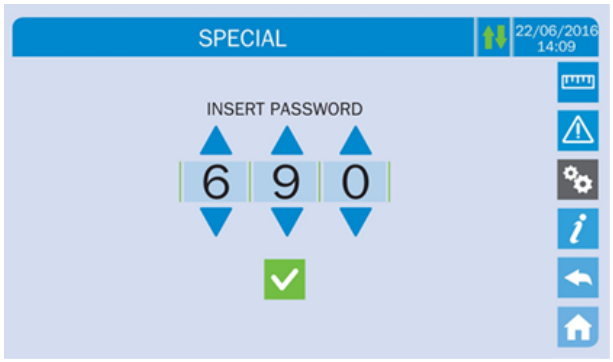



*Fig. 77. Access password in the settings section*

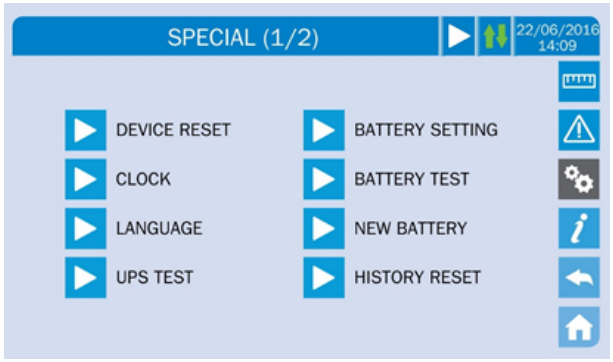



*Fig. 78. Settings section (page 1)*

The right arrow ▶ at the top indicates that there are more pages in the same section.

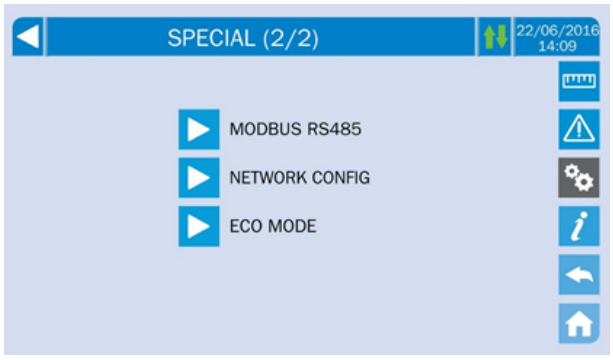



*Fig. 79. Settings section (page 2)*

The left arrow ◀ at the top allows you to return to the previous page of the section.

**Password protected access**

The SETTINGS menu is protected with a password set by the factory in order to prevent access to unauthorised personnel. We recommend minimum disclosure of the access password. Changes to operating parameters and UPS startup operations can be potentially dangerous to the device and personnel.

### 7.3.1. Restarting the device.

- The UPS is equipped with internal protections that disable the system or some of its sections. Alarms can be erased and normal operation can be resumed through the RESTART DEVICE page. If the failure persists, the UPS will return to the previous failure condition.
- In some cases, RESTART is necessary to reset any signal that fails, after which the UPS will resume operation. The failure conditions that impose a manual reset include:
  - ❒ Battery failure alarm activation (alarm A10).
  - ❒ Static switch retransfer disabling (alarm A17).
  - ❒ Scheduled maintenance request (alarm A29).
  - ❒ Voltage booster shutdown due to operation of load symmetry sensor (alarm A33).
  - ❒ Inverter shutdown due to error in voltage control loop (alarm A39).
  - ❒ Voltage booster shutdown due to error in voltage control loop (alarm A41).
  - ❒ Voltage booster shutdown due to error in current control loop (alarm A43).
  - ❒ Inverter shutdown due to operation of IGBT desaturation sensor (alarm A44).
  - ❒ Inverter shutdown due to short-circuit time exceeded (alarm A12).
  - ❒ Inverter shutdown due to thermal image protection (alarm A21).
  - ❒ Inverter shutdown due to operation of rapid disconnection sensor (alarm A36).
  - ❒ Disabled due to disconnection of parallel cable (alarm A50).
  - ❒ Disabled due to disconnection of two parallel cables (alarm A55).
  - ❒ System restart after shutdown due to EPO activation.

For a description of the status of the UPS in each of the possible failures mentioned, see section 7.5.

### 7.3.2. Date and time setting.

The date and time can be configured from the CLOCK screen.


*Fig. 80. Screen to configure the date and time.*

**Configuring the current date and time correctly.**
Correct configuration of the date and time is essential for recording events.

SLC X-PERT series devices also enable an NTP server to be configured for synchronising the date and time. This configuration is enabled by pressing DISABLED. Once the NTP server has been enabled, data can no longer be entered manually.

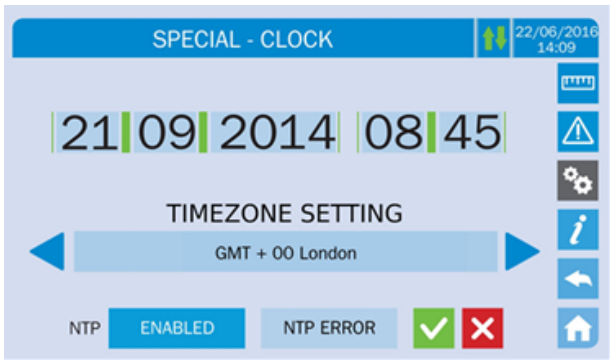



*Fig. 81. Automatic clock setting*

The NTP server access parameters can be configured in the 'Network Configuration' section. If the server does not respond or the LAN connection is missing, an 'NTP ERROR' message will be displayed.

### 7.3.3. Language setting.

The following image shows the languages that can be selected. Language selection is made by touching one of the flags.


*Fig. 82. Language configuration.*

### 7.3.4. Restarting the history.

The event history can be reset by entering the RESTART HISTORY menu; the operation requires additional confirmation.

**Data loss.**
The alarm history contains very important data for monitoring the behaviour of the device over time. It is recommended to save the data before it is deleted.

### 7.3.5. RS485 interface parameters.

- The parameters relating to communication through the RS485 interface can be configured through the RS485 menu. This menu allows you to configure the MODBUS address, communication mode and data transmission speed.

### 7.3.6. Battery setting.

#### 7.3.6.1. Installing a new battery.

The INSTALL NEW BATT. menu is used if the BCB switch has not been closed when requested in the startup phase. In this case, the system will start considering the battery to be fully discharged, activating alarm A10 (battery failure).
To configure the battery backup to 100%, it is necessary to access the menu and confirm the operation on the confirmation screen.

#### 7.3.6.2. Battery configuration.

If the UPS has been tested without knowing the characteristics of the batteries, the BATTERY SETTING menu enables that data to be configured. In particular, the following data can be configured:

- ❒ Battery capacity in ampere hours (Ah)
- ❒ Recharge current in amperes (A)
- ❒ Rated autonomy in minutes

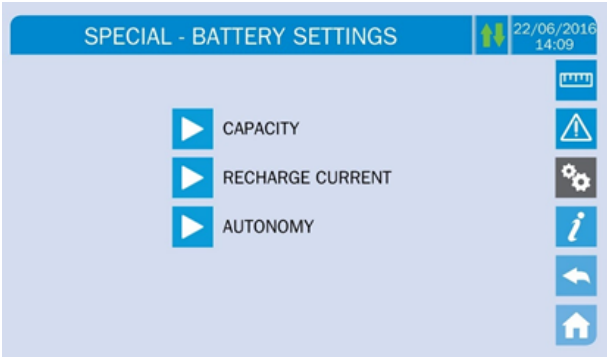



*Fig. 83. Battery parameter configuration.*

The various parameter configuration pages are similar and require the operator to enter and confirm the value.

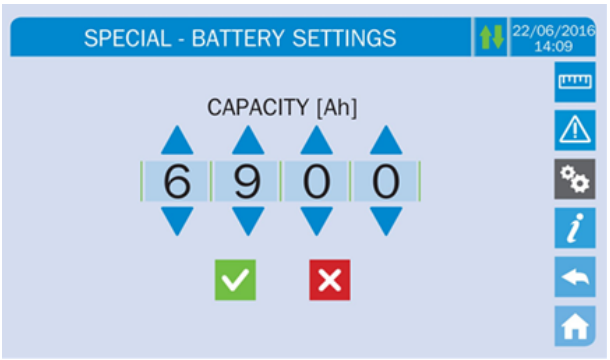



*Fig. 84. Battery parameters setting example.*

#### 7.3.6.3. Battery test.

The BATTERY TEST menu allows you to perform a short battery discharge test. If the batteries are not efficient, alarm A10 (Battery failure) is activated at the end of the test.

**Possible loss of power.**
This test can affect the continuity of the supply to the loads if the batteries are not fully charged.

### 7.3.7. UPS test.

The UP**S TEST** enables an inverter switching test to be carried out. The inverter shuts down and the load is transferred to the bypass. The power of the inverter will automatically reset after a few seconds.

**Possible loss of power.**
In case of power failure while performing this test, the immediate operation of the inverter is not guaranteed.

### 7.3.8. Network parameter configuration.

The NETWORK CONFIGURATION menu enables configuration of network parameters and the system clock synchronisation server.
All of the parameters that can be set in this section relate to the communication ports (LAN and RS485) available on the same touch screen.

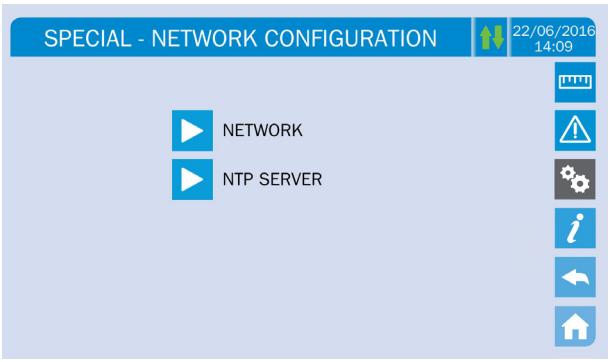



*Fig. 85. Configuration of the network parameters on the touch screen.*

#### 7.3.8.1. Configuration of the LAN parameters.

The LAN parameters that can be configured are the following:

- ❒ IP address.
- ❒ Network mask.
- ❒ Network gateway.
- ❒ Primary DNS server.
- ❒ Secondary DNS server.
- ❒ Enable/disable DHCP.

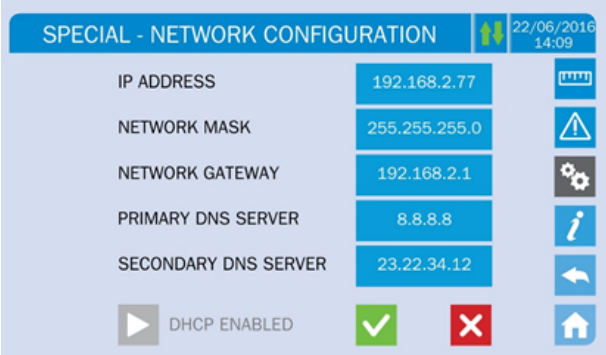



*Fig. 86. Configuration of the LAN parameters.*

7.3.8.2. Configuration of the NTP service parameters.

The NTP service parameters that can be configured are the following:

- ❒ Primary NTP server address.
- ❒ Secondary NTP server address
- ❒ Enable/disable NTP.

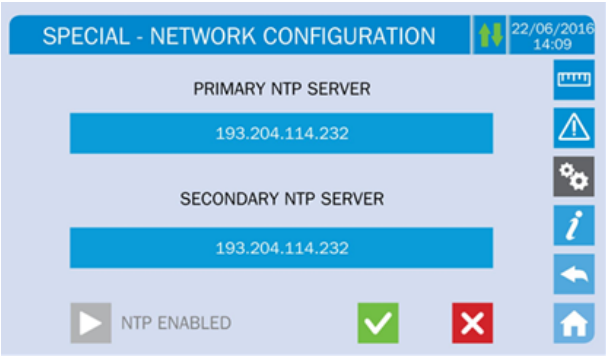



*Fig. 87. NTP parameter setting.*

The numerical parameters can be modified by touching the field that you wish to modify; the parameter will be displayed in the numeric string at the top of the screen, along with a numeric keypad.

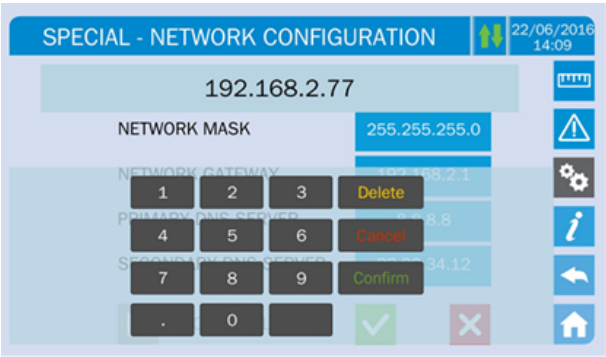



*Fig. 88. Modification of numeric parameters.*

The fields related to the NTP server can be both numeric (IP address of the remote server) and alphanumeric, when the remote server can be accessed via web address. In this case, the keypad that appears on the screen is complete.

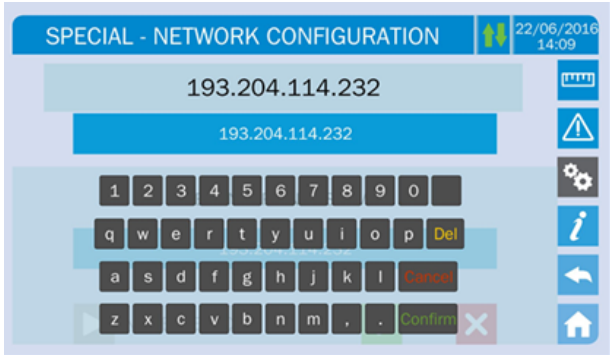



*Fig. 89. Modification of the NTP address.*

### 7.3.9. Modification of the operating mode - ECO mode.

- The ECO MODE menu allows you to modify the operating mode of the UPS from VFI mode (voltage independent of the frequency or off-line double conversion) to VFD mode (voltage dependent on frequency or line-interactive). In this mode, the load is powered directly by the AC mains and the inverter is switched on, ready to take over in case of mains malfunctions. The transfer occurs in a maximum time of 10 ms.
- The stability of the AC mains is controlled by a specific algorithm that allows automatic deactivation of VFD (line-interactive) mode if the voltage or frequency does not meet the programmed requirements.
- **Modification of ECO mode.**
  Modification of the UPS's operating mode can only be performed by specialist personnel. Before configuring the system in ECO mode, verify that the load is adequate and can withstand voltage interruptions for a maximum time of 10 ms.

The manufacturer cannot be held liable for any damage due to the inexperience of the personnel authorised by the customer.

## 7.4. SYSTEM INFORMATION.

The INFO menu provides general information about the UPS. This information is accessed by clicking on the 'i' icon shown in Fig. 90.


*Fig. 90. INFO menu.*

All information shown in the various sections is pre-set at the factory using a special interface software and cannot be modified except by personnel authorised by the manufacturer.

### 7.4.1. Device Information.

The information that the control panels can display on the device is shown below.

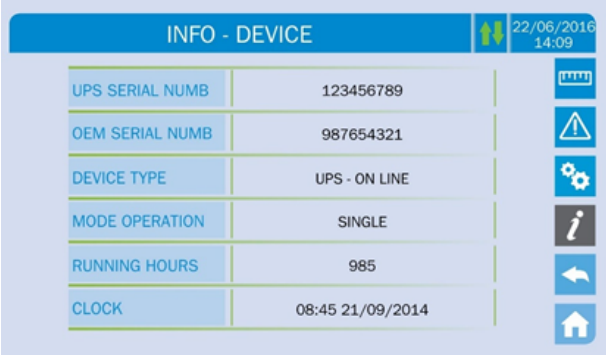



*Fig. 91. Device information.*

| Submenu | Displayed data |
|---|---|
| **SERIAL NUMBER** | Serial number of the device provided by the manufacturer and by an OEM distributor, if any. |
| **TYPE OF DEVICE** | Type of device (ON-LINE, ECO, etc.). |
| **OPERATING MODE** | This can be SINGLE or PARALLEL if the system is in parallel with other UPSs. |
| **OPERATING HOURS** | Device operating hours (record). |
| **CLOCK** | Current system date and time setting. |

*Table 19. Description of the information displayed.*

### 7.4.2. Parallel operation information.

The menu that contains the parallel operation information is only active if the UPS belongs to a parallel system or load-sync system.

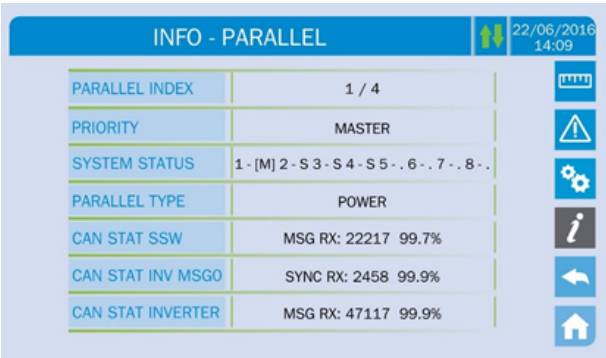



*Fig. 92. Parallel operation information*

- In the PARALLEL INDEX section, the first number identifies the position of the UPS in question in the parallel system. The second number indicates the total number of units in the system.
- The second section, PRIORITY, can have two values: 'MASTER' or 'SLAVE.' There can only be one MASTER UPS.
- The SYSTEM STATUS section (monitoring of the communication bus) provides a general indication of communication between the UPS units that make up the system.
  - ❒ The numbers represent the individual UPS units.
  - ❒ The letters M and S indicate MASTER and SLAVE respectively.
  - ❒ The square brackets **[ ]** around the letter indicate that work is being carried out on that unit.
  - ❒ A question mark next to a number indicates that the UPS is not communicating on the data bus.
- For example, let us assume that we have the following situation:
  - ❒ System composed of 4 UPSs.
  - ❒ UPS2 is currently the MASTER.
  - ❒ We are verifying communications in UPS3.
  - ❒ UPS4 is not communicating.
- The screen shown will be the following:

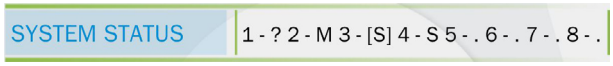



*Fig. 93. Detail of the System Status screen*

- PARALLEL TYPE
  The word in the second line can have two values, 'POWER' or 'REDUNDANCY+x.'
  - ❒ 'POWER' means that the parallel system is configured, so the presence of all of the UPS units is required to power the load.
  - ❒ 'REDUNDANCY+x' means that the system is redundant, with the redundancy index indicated by the number 'x'. If the system consists of 3 units, 'REDUNDANCY+2' means that only 1 unit is needed to power the load.

*Message statistics.* The three parts that make up the messages exchanged are:

- ❒ CAN STAT SSW: Number of messages received and percentage of reception accuracy according to the state of the static switches. The messages are exchanged between all of the devices, so the counter will be increased in all of them.
- ❒ CAN STAT INV MSG0: Number of messages received and percentage of reception accuracy according to the synchronism signals. The messages are sent by the MASTER UPS, so the counter will only increase in the SLAVE UPS devices.
- ❒ CAN STAT Inverter: Number of messages received and percentage of reception accuracy according to the system status. The messages are exchanged between all of the devices, so the counter will be increased in all of them.

### 7.4.3. Firmware version.

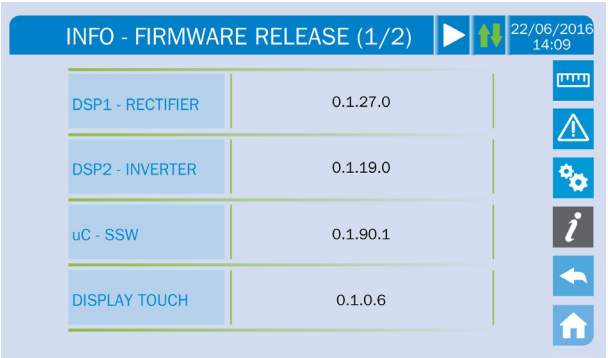



*Fig. 94. Firmware version screen.*

The second page of the firmware version contains the licence agreement relating to the touch screen's operating software.

### 7.4.4. Service information.

The SERVICE menu provides important information about SALICRU's **T.S.S.** service. The information is displayed through a text string that shows the main details of the agreement. However, also check the addresses and contact numbers indicated in this manual.

## 7.5. FAILURES AND ALARMS.

As indicated above, the system has basic diagnostics that allow immediate visualisation of the operating conditions. In case of alarm, the corresponding red icon on the control panel will light up, and the audible alarm will be activated (if enabled).

**Danger of injury due to electric shock!**

Before carrying out any operation on the UPS, verify that all of the safety precautions have been met:

- Any work on the unit must be performed by qualified personnel.
- The internal components can only be accessed after disconnecting the device from the power supplies.
- Always use protection devices designed for each type of activity.
- The instructions contained in the manuals must be strictly followed.
- In case of doubt or the impossibility of solving a problem, contact SALICRU immediately.

### 7.5.1. Definition of operating states.

| **State** | S1 | BOOSTER OK |
|---|---|---|
| Description | The rectifier is working correctly. | |
| Operating status | The rectifier is powering the inverter and keeping the batteries charged. | |
| **State** | S2 | BATTERY OK |
| Description | The batteries are connected to the UPS. | |
| Operating status | The batteries are being kept charged by the rectifier and are ready to power the inverter. | |
| **State** | S3 | INVERTER OK |
| Description | The voltage and frequency of the inverter are within the permitted range. | |
| Operating status | The inverter is ready to power the load. | |
| **State** | S4 | INVERTER-->LOAD |
| Description | Inverter powering load. | |
| Operating status | The load is being powered through the inverter's static switch. | |
| **State** | S5 | INV BYPASS SYNC |
| Description | The inverter is synchronised with the bypass. | |
| Operating status | The synchronisation between the inverter and the bypass is correct, and the static switch can switch between the two sources. | |
| **State** | S6 | BYPASS OK |
| Description | The bypass voltage and frequency are within the permitted range. | |
| Operating status | The bypass line is ready for switching in case of inverter failure. | |
| **State** | S7 | BYPASS --> LOAD |
| Description | Load powered through the bypass line. | |
| Operating status | The load is being powered by the bypass through the static switch, waiting for the inverter to restart. | |
| **State** | S8 | INV MASTER SYNC |
| Description | The inverter is synchronised with the MASTER UPS. | |
| Operating status | This state only appears in the SLAVE UPS units and indicates that the inverter is synchronised with the signal sent by the MASTER UPS. | |
| **State** | S10 | RECT. IN STANDBY |
| Description | The rectifier is in standby mode. | |
| Operating status | The rectifier is switched off and ready to start charging the batteries (High-Efficiency algorithm). | |

| **State** | S11 | INV. IN STANDBY |
|---|---|---|
| Description | The inverter is in standby mode. | |
| Operating status | The inverter is switched off and ready to start in the event of a malfunction of the bypass network. | |
| **State** | S12 | BATT. IN STANDBY |
| Description | The batteries are in standby mode. | |
| Operating status | The static switch of the batteries is open and the batteries are disconnected from the DC bus. | |
| **State** | S14 | BATT CHARGING I |
| Description | The batteries are charging. | |
| Operating status | The static switch of the batteries is closed and the batteries are in the first phase of the I/U charging mode (DIN 41773), with constant current and increasing voltage. | |
| **State** | S15 | BATT CHARGING U |
| Description | The batteries are charging. | |
| Operating status | The static switch of the batteries is closed and the batteries are in the second and final phase of the I/U charging mode (DIN 41773), with constant current and decreasing voltage. | |

*Tab. 20.* ***Description of the operating states.***

### 7.5.2. Troubleshooting guide.

- If the UPS is not working properly, check the information shown on the LCD of the control panel and act accordingly depending on the device model.
- Consult this section's troubleshooting guide and try to solve the problem. If it persists, contact our Technical Service and Support (**T.S.S.**).
- If it is necessary to contact our Technical Service and Support (**T.S.S.**), provide the following information:
  - ❒ UPS model and serial number.
  - ❒ Date on which the issue occurred.
  - ❒ Full description of the issue, including information provided by the LCD or LEDs and state of the alarm.
  - ❒ Power supply conditions, type of load and level of load applied to the UPS, ambient temperature, ventilation conditions.
  - ❒ Battery information (capacity and number of batteries), whether the device is a (B0) or (B1).
  - ❒ Any other information considered relevant.

| CODE | ALARM | DESCRIPTION | POSSIBLE CAUSE | SOLUTION |
|---|---|---|---|---|
| A1 | INPUT FAILURE | The input line's voltage or frequency is out of tolerance. | Mains instability or failure.<br>Incorrect phase rotation. | Check connections to electrical mains.<br>Check stability of mains voltage. |
| A2 | PHASE SEQ ERROR | The phase rotation in the rectifier input line is incorrect. | Incorrect connection of power cables | Check phase rotation |
| A3 | BOOSTER STOPPED | The rectifier has been temporarily disconnected and the batteries are powering the inverter. | AC line voltage or frequency instability.<br>Possible failure in rectifier control circuit. | Check AC line voltage parameters.<br>Restart device. |
| A4 | BOOSTER FAILURE | The rectifier has been disconnected due to an internal failure. | Possible failure in rectifier control circuit. | Check which alarms are present and perform indicated procedures.<br>Restart device. |
| A5 | DC VOLTAGE FAILURE | The DC voltage is out of tolerance. | The batteries reach discharge voltage due to power failure.<br>Measurement circuit failure. | Check actual value of DC voltage measured.<br>In case of mains failure, wait for AC voltage to be restored.<br>Check which alarms present and perform relevant procedures.<br>Restart device. |
| A6 | BATTERY TEST | The rectifier's voltage has been reduced to start a brief controlled discharge of the batteries. | Battery test started automatically or manually by user. | Wait until end of test and check for possible battery malfunction. |

| CODE | ALARM | DESCRIPTION | POSSIBLE CAUSE | SOLUTION |
|---|---|---|---|---|
| A7 | BCB OPEN | The battery circuit breaker is open. | Battery circuit breaker open. | Check state of battery circuit breaker.<br>Check functioning of circuit breaker's auxiliary contact.<br>Check connection between circuit breaker's auxiliary contact and UPS's auxiliary terminals. |
| A8 | BATTERIES DISCHARGING | The batteries are discharging. | Batteries discharging due to a mains failure.<br>Rectifier failure. | Check which alarms present and perform relevant procedures. |
| A9 | END BATT. BACKUP | The batteries have reached the pre-alarm discharge level. | Batteries discharging due to mains failure.<br>Rectifier failure. | Check which alarms present and follow instructions. |
| A10 | BATTERY FAILURE | Failure after a battery test. | Battery failure | Check batteries.<br>Restart the system. |
| A11 | SHORT CIRCUIT | The current sensor has detected a short-circuit at the output. | Problems in the loads.<br>Measurement circuit failure. | Check loads connected to UPS output. |
| A12 | SHUTDOWN DUE TO SHORT-CIRCUIT | The inverter is disabled due to a prolonged short-circuit during a mains failure or an overcurrent at the input of the inverter jumper. | Short-circuit in loads during power failure.<br>Inverter jumper failure.<br>Temporary current spike. | Restart the system. |
| A13 | INV. OUT OF TOL. | The inverter's voltage or frequency is out of tolerance. | Inverter shutdown due to an alarm.<br>Inverter failure. | Check which alarms present and perform relevant procedures. |
| A14 | BYP PHASE SEQ ERR | The phase rotation of the bypass line is incorrect. | Incorrect connection of power cables | Check phase rotation. |
| A15 | BYPASS FAILURE | The voltage or frequency of the bypass line is out of tolerance. | Bypass line instability.<br>Incorrect phase rotation. | Check mains connection.<br>Check mains voltage stability. |
| A16 | BYPASS --> LOAD | The load is powered through the bypass line. | Temporary transition due to inverter failure. | Check status of inverter and alarms present. |
| A17 | RETRANSFER DISABLED | The load is disabled on the bypass line. | Very frequent switching due to load current spikes.<br>Problems with static switch. | Reset the system.<br>Check load current spikes. |
| A18 | MBCB CLOSED | The manual bypass circuit breaker is closed. | Manual bypass circuit breaker closed. | Check status of manual bypass circuit breaker.<br>Check functioning of circuit breaker's auxiliary contact. |
| A19 | OCB OPEN | The output circuit breaker is open. | Output circuit breaker open. | Check status of output circuit breaker.<br>Check functioning of circuit breaker's auxiliary contact. |
| A20 | OVERLOAD | The current sensor has detected an overload at the output. If the alarm persists, the thermal image protection will be activated (alarm A21). | Overload at output.<br>Measurement circuit failure. | Check loads connected to UPS output. |
| A21 | THERMAL IMAGE | The thermal image protection has been activated after a prolonged overload in the inverter. The inverter shuts down for 30 minutes and then restarts. | Overload at output.<br>Measurement circuit failure. | Check loads connected to UPS output.<br>If you need to restore the power of the inverter immediately.<br>Restart the system. |
| A22 | BYPASS SWITCH | The 'Normal/Bypass' selector has been activated. | Maintenance tasks | Check position of selector. |
| A23 | EPO PRESSED | The system is disabled due to activation of the emergency power off button. | Activation of emergency power off button (local or remote). | Release emergency power off button and reset alarm. |
| A24 | HIGH TEMPERATURE | Heat sink temperature high in the inverter jumper or tripping of the DC fuses that protect the jumper. | Heat sink cooling fan failure.<br>Room or cooling air temperature too high.<br>Tripping of DC protection fuses. | Check fan operation.<br>Clean ventilation grilles and air filters, if any.<br>Check air conditioning system (if any).<br>Check state of DC fuses at inverter jumper input. |
| A25 | INVERTER OFF | The inverter is disabled due to a malfunction. | Several | Reset the system. |
| A26 | COMMUNICATION ERROR | Internal error. | Microcontroller communication problems. | If the alarm persists, contact our Technical Service and Support (T.S.S.). |
| A27 | EMPROM ERROR | The controller has detected an error in the parameters stored in the EEPROM. | Entering of incorrect parameters during programming. | If the alarm persists, contact our Technical Service and Support (T.S.S.). |
| A28 | CRITICAL FAILURE | An alarm is activated which disables a part of the UPS (rectifier, inverter, static switch). | System fault. | Check which alarms present and follow procedure indicated. |
| A29 | MAINT. REQUIRED | Maintenance needed. | Time limit since last maintenance exceeded. | Contact our Technical Service and Support (T.S.S.). |

| CODE | ALARM | DESCRIPTION | POSSIBLE CAUSE | SOLUTION |
|---|---|---|---|---|
| A30 | COMMON ALARM | Cumulative alarm | At least one alarm activated. | Check which alarms present and follow instructions. |
| A31 | MBCB BUS CLOSED | The manual bypass circuit breaker is closed. | Manual bypass circuit breaker closed. | Check status of manual bypass circuit breaker.<br>Check functioning of circuit breaker's auxiliary contact. |
| A32 | EPO BUS CLOSED | The system is disabled due to activation of the emergency power off button. | Activation of emergency power off button (local or remote). | Release emergency power off button and reset alarm. |
| A33 | ASYMMETRIC LOAD | The voltages measured in the DC capacitors (positive and negative with respect to the central point) are different. | Possible fault in measuring circuit.<br>Possible DC capacitor malfunction. | Reset the system. |
| A34 | SERVICE REQUIRED | An inspection of the UPS is necessary. | Possible UPS malfunction.<br>Possible DC capacitor malfunction. | If the alarm persists, contact our Technical Service and Support (T.S.S.). |
| A35 | DIESEL MODE | The UPS is powered by a diesel generator. | The auxiliary diesel generator activation contact connected to the UPS is closed and requires this operating mode. | Wait for the diesel generator to be disabled once the voltage has been restored.<br>Check the connection of the auxiliary signal contact at the start of the diesel generator in terminals XD1/XD2. |
| A36 | RAPID DC SHUTDOWN | Inverter shutdown due to the intervention of the protection sensor for unexpected variations in DC voltage. | Battery failure. | Check batteries.<br>Reset the system. |
| A38 | INVERTER-->LOAD | The load is powered by the inverter. Alarm active in 'ECO' mode, where the main supply comes from the bypass network. | Temporary transfer due to lack of bypass network. | Check the status of the bypass network and any alarms present. |
| A39 | INVERT. LOOP ERR. | The control cannot accurately regulate the voltage of the inverter. | Regulation system fault. | Reset the system. |
| A40 | SSI FAILURE | The system has detected a static switch malfunction. | Possible load problems.<br>Static switch malfunction. | Check absorption of loads and possible presence of continuous components on AC current. |
| A41 | RECT. LOOP ERR. | The control cannot accurately regulate the output voltage of the rectifier. | Regulation system fault. | Reset the system. |
| A44 | Inverter DESAT | The inverter is disabled due to the intervention of the desaturation sensor of the IGBT drivers. | Inverter jumper fault. | Reset the system. |
| A45 | HIGH TEMP. SSW | High static switch heat sink temperature. | Heat sink cooling fan fault.<br>Room or cooling air temperature too high. | Check fan operation.<br>Clean ventilation grilles and any air filters.<br>Check air conditioning system (if any). |
| A46 | REDUND. LOST | Alarm only activated in parallel systems. Continuity is not guaranteed in the event of malfunction of one of the UPSs. | Total load greater than expected maximum value.<br>Possible fault in measuring circuit. | Check load powered by system. |
| A47 | PARAMETER SEND ERROR | Internal error. | Microcontroller communication problems. | Contact our Technical Service and Support (T.S.S.). |
| A48 | PARAMETER RECEP. ERROR | Internal error. | Microcontroller communication problems. | Contact our Technical Service and Support (T.S.S.). |
| A49 | TEST MODE ERROR | Internal error. | Microcontroller communication problems. | Contact our Technical Service and Support (T.S.S.). |
| A60 | RECTIFIER DESATURATION | The rectifier is disabled due to the intervention of the desaturation sensor of the IGBT drivers. | Rectifier jumper fault. | Reset the system. |
| A51 | BATTERY TEMPERATURE | The temperature of the batteries is out of tolerance limits. This alarm is only activated if the battery probe is installed and enabled. | Abnormal temperature inside external battery cabinet.<br>Possible fault in measuring circuit. | Check temperature of batteries and eliminate cause of alarm. |
| A53 | FIRMWARE ERROR | The controller has detected an incompatibility in the control firmware. | Software update not executed correctly. | Contact our Technical Service and Support (T.S.S.). |
| A54 | CAN ERROR | Internal error. | Microcontroller communication problems. | Contact our Technical Service and Support (T.S.S.). |
| A55 | PARALL. CAB. DISCONN. | The parallel cable is not communicating. | Parallel cable disconnected or damaged. | Check the connection of the cable. |
| A56 | MAINS UNBAL. | The input voltage of the rectifier is unbalanced. | Problems in the AC power mains.<br>Device measurements circuit failure. | Check input voltage. |
| A59 | BACKFEED RL ON | The backfeed relay has been activated. This alarm only appears in the history. | Problems in static switch of bypass. | Check static thyristors |

| CODE | ALARM | DESCRIPTION | POSSIBLE CAUSE | SOLUTION |
|---|---|---|---|---|
| A61 | MAX VDC | Redundant power supply failure. | Internal failure. | Contact our Technical Service and Support (T.S.S.). |
| A62 | MAINS OV | Sudden increase in AC input voltage (rapid sensor). | Voltage spike in the AC mains.<br>Possible internal failures. | Check mains voltage. |
| A63 | STARTUP SEQ. FAILURE | During UPS startup, a failure prevented correct sequence execution. | Control devices in incorrect position or incorrectly operated.<br>Possible internal failure. | Confirm that the position of the control devices (circuit breakers, selectors) is the one specified in the procedures. |
| A64 | MAINS UV | Sudden drop in AC input voltage (rapid sensor). | Voltage drop in AC mains.<br>Possible internal failures. | Check mains voltage. |

*Table 21. Alarm description, causes and solutions.*

If any of the alarms persist, contact our **T.S.S.**

# 8. MAINTENANCE, WARRANTY AND SERVICE.

## 8.1. BATTERY MAINTENANCE.

- Pay attention to all of the safety instructions concerning batteries indicated in section 1.2.3 of the EK266*08 manual.
- The service life of the batteries directly depends on the ambient temperature and other factors such as the number of charges and discharges, as well as their depth. Their service life is designed to be between 3 and 5 years if the ambient temperature to which they are exposed is between 10 and 20°C. Different types of battery with different service lives are available upon request.
- SLC X-PERT series UPSs require minimum upkeep. The batteries used in the standard models are lead acid, sealed, valve regulated and maintenance free. The only requirement is to charge the batteries regularly to extend their life expectancy.
  While the UPS is connected to the mains supply, whether or not it is running, it will keep the batteries charged and also offer protection from overcharging and deep discharge.

### 8.1.1. Notes for the installation and replacement of batteries.

- If it is necessary to replace any connection cables, original materials can be purchased through our **T.S.S.** or authorised distributors. Using inappropriate cables can lead to overheating in connections, resulting in a fire hazard.
- Inside the device, there are permanent dangerous voltages even without mains supply present through its connection to the batteries and especially in UPSs where the electronics and batteries share a box.
  Also take into consideration that the battery circuit is not isolated from the input voltage, so there is a risk of discharge with dangerous voltages between the battery terminals and the earth terminal, which is in turn connected to earth (any metal part of the device).
  Repair and/or maintenance work must be carried out by our **T.S.S.** except for the replacement of batteries, which can be performed by qualified personnel familiar with them. No other person should handle them.
- Depending on the configuration of the UPS, certain actions need to be carried out before handling the batteries:
  - ❒ Devices with batteries and electronics sharing the same box.
    - – Shut down the loads and device completely.
    - – Disconnect the SLC X-PERT from the mains.
    - – Open the device to access the interior.
    - – Remove the fuse or internal battery fuses.
    - – Release the battery holders and replace the batteries.
    - – Perform the above steps in reverse to return the device to how it was at the start, including startup.
  - ❒ UPS with batteries and electronics in separate boxes.
    - – Shut down the loads and device completely.
    - – Disconnect the SLC X-PERT from the mains.
    - – Disconnect the battery module from the UPS.
    - – Open the battery module to access the interior.
    - – Remove the fuse or internal battery fuses.
    - – Release the battery holders and replace the batteries.
    - – Perform the above steps in reverse to return the device to how it was at the start, including startup.

## 8.2. WARRANTY CONDITIONS.

### 8.2.1. Terms of the warranty.

On our website, you will find the warranty conditions for the product you have purchased where you can also register it. You are recommended to do so as soon as possible so that it can be included in the database of our Technical Service and Support (**T.S.S.**). Among other advantages, it will streamline any regulatory procedures for the intervention of **T.S.S.** in the event of a fault.

### 8.2.2. Exclusions.

The company will not be bound by the warranty if the defect in the product is considered to not exist or to have been caused by improper use, negligence, inadequate installation and/or verification, unauthorised attempts at repair or modification, accident, fire, lightning or other hazards, or any other actions beyond its intended use. Nor shall it cover any compensation for loss or damage.

## 8.3. TECHNICAL SERVICES NETWORK.

Information about our national and international Technical Service and Support (**T.S.S.**) centres can be found on our website.

# 9. ANNEXES.

## 9.1. GENERAL TECHNICAL SPECIFICATIONS.

| **Model** | | **SLC X-PERT** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Power (kVA)** | | **80** | **100** | **125** | **160** | **200** | **250** | **300** | **400** |
| **Active power (kW)** | | **80** | **100** | **125** | **160** | **200** | **250** | **300** | **400** |
| **GENERAL** | | | | | | | | | |
| UPS type | | On-line double-conversion | | | | | | | |
| Efficiency (%) (VFI: on-line double-conversion) | 25 % load | 93.0 | 93.0 | 93.0 | 93.0 | 94.5 | 94.5 | 94.5 | > 94.8 |
| | 50% load | 94.5 | 94.5 | 94.5 | 94.5 | 95.5 | 95.5 | 95.8 | 96.0 |
| | 75 % load | 95.0 | 95.0 | 95.0 | 95.0 | 96.0 | 96.0 | 96.0 | > 96.0 |
| | 100 % load | 95.0 | 95.0 | 95.0 | 95.0 | ≥95.5 | 95.5 | 95.5 | > 95.8 |
| Efficiency (%) (VFD ECO MODE) load ≥50% | | ≥98.0 | | | | | | | |
| Losses with rated load (kW) | | 4.2 | 5.3 | 6.6 | 8.4 | 9.4 | 11.8 | 14.1 | 17.5 |
| Ambient eorking temperature (°C) | UPS | 0... 40 | | | | | | | |
| | Battery | 0... 25 | | | | | | | |
| Storage temperature (°C) | UPS | -10... 70 | | | | -10... 70 | | | |
| | Battery | -10... 60 | | | | -15... 40 | | | |
| Relative humidity, non-condensing (%) | | <95 | | | | | | | |
| Maximum working altitude (m) | | <2400 masl | | | | | | | |
| Ventilation | | Forced | | | | | | | |
| Cooling air flow ($m^3/h$) | | 1000 | 1200 | 1200 | 1500 | 1800 | 2200 | 2300 | 4000 |
| Noise (dB) | | <60 | | | | <65 | | | <72 |
| No. battery cells (lead) | | 360... 372 | | | | | | | |
| Protection rating | | IP20 | | | | | | | |
| Electromagnetic compatibility | | EN-IEC 62040-2 (EC marking) | | | | | | | |
| Safety | | EN-IEC 62040-1 | | | | | | | |
| Operation and test | | EN-IEC 62040-3 | | | | | | | |
| Quality and Environment | | ISO 9001 – ISO 14001 | | | | | | | |
| Colour | | RAL 9005 | | | | | | | |
| Accessibility | | Front and side access | | | | Front access | | | |
| Installation | | Against the wall | | | | | | | |
| Overall dimensions (mm) | Depth | 940 | | | | 970 | | | 970 |
| | Width | 560 | | | | 880 | | | 1450 |
| | Height | 1500 | 1800 | | | 1978 | | | 1978 |
| Weight (without batteries) (kg) | | 300 | 320 | 360 | 380 | 720 | 850 | 900 | 1080 |
| Weight (with batteries) (kg) | | 850 | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Input/output terminals | | Input cables from below | | | | | | | |
| Handling | | Base for forklift | | | | | | | |
| Storage and transportation conditions | | According to EN 62040-3 | | | | | | | |
| Front panel | | 10" touch screen | | | | | | | |
| Potential-free contacts interface | | Optional for signalling/alarms | | | | | | | |
| Serial communication interface | | Standard: RS-232/USB<br>Optional: RS-485 (MODBUS RTU Protocol) | | | | | | | |
| Parallel configuration (optional) | | Up to 5+1 (redundant parallel)<br>Up to 6 (parallel with power)[1)] | | | | | | | |
| **RECTIFIER AND BATTERY CHARGER** | | | | | | | | | |
| Input | | 3 phases/4 wires | | | | | | | |
| Three-phase rated input voltage (Vac) | | 3x400 | | | | | | | |
| Tolerance (%) | | -20... +15 | | | | | | | |

| Model | | SLC X-PERT | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Power (kVA)** | | **80** | **100** | **125** | **160** | **200** | **250** | **300** | **400** |
| **Active power (kW)** | | **80** | **100** | **125** | **160** | **200** | **250** | **300** | **400** |
| Input frequency (selectable) (Hz) | | 50 - 60 | | | | | | | |
| Tolerance (%) | | ±10 | | | | | | | |
| Input power factor | | >0.99 | | | | | | | |
| Input current harmonic distortion (at rated voltage and THDv <0.5%) (%) | 25 % load | <5 | | | | | | | |
| | 50% load | <4 | | | | | | | |
| | 75 % load | <3 | | | | | | | |
| | 100 % load | <3 | | | | | | | |
| Output voltage static stability (%) | | ±1 | | | | | | | |
| Output voltage ripple (%) | | <1 (rms) | | | | | | | |
| Battery recharging characteristics | | Intermittent load with prevailing state of complete standby and control of the state of the IU batteries (DIN 41773) | | | | | | | |
| Maximum battery recharging current (A) | | | | | | | | | |
| - With rated output load | | 15 | 15 | 20 | 20 | 30 | 40 | 40 | 50 |
| - Maximum current with DCM function | | 50 | 50 | 50 | 50 | 100 | 100 | 100 | 100 |
| Rectifier jumper type | | IGBT – PFC | | | | | | | |
| Input protections | | Fuses | | | | | | | |
| Rated input current (A) (with rated load and charged batt.) | | 122 | 152 | 190 | 243 | 302 | 378 | 453 | 603 |
| Maximum input current with minimum voltage (A) (with rated load and maximum recharging current) | | 175 | 212 | 267 | 334 | 423 | 518 | 611 | 829 |
| Soft-start ramp time (Walk-in) (s) | | 5... 30 (programmable) | | | | | | | |
| Sequential startup (hold off) (s) | | 1... 300 (programmable) | | | | | | | |
| **BATTERIES** | | | | | | | | | |
| Battery type (standard) | | Sealed lead acid (VRLA - maintenance free) | | | | | | | |
| Number of cells | | 360... 372 | | | | | | | |
| Float voltage at 25 °C (Vdc) | 360 el. | 812 | | | | | | | |
| | 372 el. | 840 | | | | | | | |
| Minimum discharge voltage (Vdc) | 360 el. | 620 | | | | | | | |
| | 372 el. | 632 | | | | | | | |
| Power consumed by the inverter (kW) (with rated load cosφ=1) | | 82.5 | 103.1 | 128.9 | 164.9 | 204.1 | 255.1 | 306.1 | 407.7 |
| Power consumed by the inverter (with rated load and minimum discharge voltage) (A) | | 133 | 166 | 208 | 266 | 329 | 411 | 494 | 658 |
| Protection | | Fuses | | | | | | | |
| Test | | Included as standard | | | | | | | |
| **INVERTER** | | | | | | | | | |
| Inverter jumper | | IGBT (high frequency PWM) | | | | | | | |
| Rated apparent power cosφ=1 (kVA) | | 80 | 100 | 125 | 160 | 200 | 250 | 300 | 400 |
| Rated active power cosφ=1 (kW) | | 80 | 100 | 125 | 160 | 200 | 250 | 300 | 400 |
| Efficiency (%) DC/AC | 25% load | 96.0 | | | | | | | |
| | 50% load | 97.0 | | | | | | | |
| | 75% load | 97.0 | | | | | | | |
| | 100% load | 98.1 | | | | | | | |
| Output | | 3 phases/4 wires | | | | | | | |
| Three-phase rated output voltage (Vac) | | 3x380 / 3x400 / 3x415 | | | | | | | |
| Output voltage stability | | | | | | | | | |
| - Static (balanced load) (%) | | ±1 | | | | | | | |
| - Static (unbalanced load) (%) | | ±2 | | | | | | | |
| -Dynamics (load: 20%-100%-20%) (%) | | ±5 | | | | | | | |
| - Voltage recovery after load change (ms) | | <20 | | | | | | | |
| - Classification according to EN-IEC 62040-3 | | VFI-SS-11 | | | | | | | |

| Model | | SLC X-PERT | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Power (kVA)** | | **80** | **100** | **125** | **160** | **200** | **250** | **300** | **400** |
| **Active power (kW)** | | **80** | **100** | **125** | **160** | **200** | **250** | **300** | **400** |
| Phase shift (°) | | | | | | | | | |
| - Balanced load | | ±1 | | | | | | | |
| - Unbalanced load (100%-0%-0%) | | ±1 | | | | | | | |
| Output frequency (Hz) | | 50 - 60 | | | | | | | |
| Output frequency stability | | | | | | | | | |
| - Internal clock (mains not present) (Hz) | | ±0.001 | | | | | | | |
| - Inverter synchronised with mains (Hz) | | ±2 | | | | | | | |
| - Max. synchronisation frequency (Hz/s) | | <1 | | | | | | | |
| Rated output current (@400 Vac) (A) | | 115 | 144 | 180 | 231 | 289 | 361 | 433 | 577 |
| Permissible overload | | | | | | | | | |
| (min) | >100... 110 % | 10 | | | 10 | | | | |
| (min) | >110... 125 % | | | | 5 | | | | |
| (s) | >125... 150 % | 30 | | | | | | | |
| (ms) | >150 % | 100 | | | | | | | |
| Short-circuit current [2] (A) | | 330 | 400 | 490 | 640 | 720 | 900 | 1050 | 1400 |
| Short-circuit characteristics | | Limited current with electronic protection<br>Automatic shutdown after 5 seconds | | | | | | | |
| Output waveform | | Sine wave | | | | | | | |
| Total harmonic distortion THDv | | | | | | | | | |
| - With linear load (%) | | <1 | | | | | | | |
| - With non-linear load (%) | | <5 | | | | | | | |
| - EN-IEC 62040-3 | | Requirement compliance | | | | | | | |
| Max. crest factor without degradation | | 3:1 | | | | | | | |
| **BYPASS** | | | | | | | | | |
| Automatic bypass | | Electronic thyristor | | | | | | | |
| Input | | 3 phases/4 wires | | | | | | | |
| Protection | | Fuses | | | | | | | External |
| Three-phase rated input voltage (sel.) (Vac) | | 3x380 / 3x400 / 3x415 | | | | | | | |
| Tolerance (selectable) (%) | | ±10 | | | | | | | |
| Input frequency (selec.) (Hz) | | 50... 60 | | | | | | | |
| Tolerance (selectable) (%) | | ±10 | | | | | | | |
| Transfer mode | | Uninterrupted | | | | | | | |
| Transfer from inverter to bypass | | In case of:<br>- Short-circuit<br>- Discharged batteries<br>- Inverter test<br>- Inverter failure | | | | | | | |
| Retransfer from bypass to inverter | | Automatic<br>Bypass disabled in case of 6 transfers in 2 min, restart by screen | | | | | | | |
| Overload capacity (%) | | 150% permanently<br>1000 % for 1 cycle | | | | | | | |
| Manual bypass (maintenance) | | Electronically controlled<br>Assisted restart procedure without interruption | | | | | | | |
| Backfeed protection | | NC contact for control of an external device | | | | | | | |
| Automatic bypass | | Uninterrupted | | | | | | | |

*Table 22. **SLC X-PERT UPS technical specifications***

[1] For configurations with more devices, contact the manufacturer
[2] Value refers to IK1 - IK2 - IK3 type short-circuits

## 9.2. GLOSSARY.

- **AC.** Alternating current is electric current in which the magnitude and direction vary cyclically. The waveform of the most commonly used alternating current is that of a sine wave, since this achieves a more efficient transmission of energy. In certain applications, however, other periodic waveforms are used, such as triangular or square.
- **Bypass.** Manual or automatic, this is the physical connection between the input of an electrical device and its output.
- **DC.** Direct current is the continuous flow of electrons through a conductor between two points with different potential. Unlike AC, in DC, electrical loads always circulate in the same direction from the point of greatest potential to the lowest. Although DC is commonly identified as a continuous current (for example, that supplied by a battery), any current that always maintains the same polarity is continuous.
- **DSP.** Digital signal processor. A DSP is a processor or microprocessor-based system that has a set of instructions, hardware and optimised software for applications that require numerical operations at very high speed. Because of this, it is especially useful for the processing and representation of analogue signals in real time: in a system that works in this way (real time) samples are usually received from an analogue/digital converter (ADC).
- **Power factor.** The power factor, PF, of an AC circuit is defined as the ratio between active power, P, and apparent power, S, or as the cosine of the angle formed by the current and voltage factors, designated in this case as cos f, where f is the value of the angle.
- **GND.** This stands for GROUND or EARTH and, as the name indicates, refers to the potential of the surface of the Earth.
- **IGBT.** An insulated gate bipolar transistor is a semiconductor device that is generally used as a controlled switch in power electronics circuits. This device possesses the characteristics of the gate signals of field effect transistors with the capacity for high current and low saturation voltage of the bipolar transistor, combining an isolated FET gate for input and control and a bipolar transistor as a single switch in a single device. The IGBT's excitation circuit is similar to that of the MOSFET, while the conducting characteristics are similar to those of the BJT.
- **Interface.** In electronics, telecommunications and hardware, an interface (electronics) is the port (physical circuit) through which signals are sent or received from one system or subsystem to another.
- **kVA.** A volt-ampere is the unit used for apparent power in electrical current. In DC, it is practically equal to real power but, in AC, it can differ from this depending on the power factor.
- **LCD.** Liquid crystal display, a device invented by Jack Janning, who was an employee of NCR. It is an electrical system for data presentation formed by 2 transparent conductive layers and a special crystalline material in the middle (liquid crystal) which have the ability to orientate light as it passes through.
- **LED.** Light-emitting diode, a semiconductor device (diode) that emits light that is almost monochromatic, that is to say, it has a very narrow spectrum when it is polarised directly and is penetrated by an electric current. The colour (wavelength) depends on the semiconductor material used in the construction of the diode, and can vary from ultraviolet, passing through the visible light spectrum, to infrared, the latter called IRED (infra-red emitting diode).
- **Circuit breaker.** A circuit breaker is a device capable of interrupting the electrical current of a circuit when it exceeds certain maximum values.
- **Disconnector.** Mechanical disconnecting device with two alternative positions with a separation between contacts that satisfies the minimum physical spacing between the two parts of the mains where it is located. In case of failure of the circuit in which it is located, it opens its contacts automatically, thus isolating the failure. They can open or close circuits only when they are without loads.
- **On-line mode.** A device is said to be on-line when it is connected to a system, is operative, and normally has its power supply connected.
- **Inverter.** An inverter is a circuit used to convert DC into AC. The function of an inverter is to change a DC input voltage to a symmetrical AC output voltage, with the magnitude and frequency desired by the user or designer.
- **Rectifier.** In electronics, a rectifier is the element or circuit that converts AC into DC. This is done by using rectifier diodes, whether solid state semiconductors, vacuum valves or gaseous valves, such as those containing mercury vapour. Depending on the characteristics of the AC power that they use, they are classified as single-phase when they are powered by a mains phase or three-phase when they are powered by three phases. Depending on the type of rectification, they can be half wave when only one of the half cycles of the current is used or full wave when both half cycles are used.
- **Relay.** A relay is an electromechanical device that functions as a switch controlled by an electrical circuit in which, by means of an electromagnet, a set of one or several contacts is activated to enable other independent electrical circuits to be opened or closed.
- **SCR.** Silicon controlled rectifier, commonly known as a thyristor, a 4-layer semiconductor device that works as an almost ideal switch.
- **THD.** Total harmonic distortion. Harmonic distortion occurs when the output signal of a system does not equal the signal that entered it. This lack of linearity affects the waveform because the device has introduced harmonics that were not in the input signal. Since they are harmonic, that is to say, multiples of the input signal, this distortion is not so dissonant and is less easy to detect.

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